1961 Volume 18, Number 12

PREVENTION OF DETERIORATION

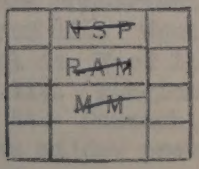
ABSTRACTS

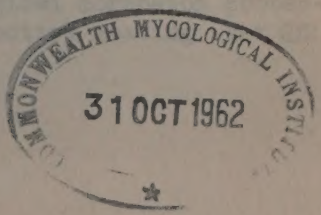
Contents

Cross References..... xxxv-xxxvii
Biological Agents..... Biol 75-78
Ceramics, Cements, Glass, and Plaster..... Cer 43-49
Electrical and Electronic Equipment..... Elec 33-39
Fungicides and Other Toxic Compounds..... Fung 101-111
Lacquers, Paints, and Varnishes..... Lac 67-74
Metals..... Met 211-227
Miscellaneous..... Misc 89-99
Plastics, Resins, Rubbers, and Waxes..... Plas 115-126
Textiles and Cordage..... Text 73-77
Wood and Paper..... Wood 107-118

Prevention of Deterioration Center

National Research Council, National Academy of Sciences
2101 Constitution Ave., Washington 25, D. C.
Executive 3-8100





Biological Agents

Biological toxicants Fung 109. Mycobacteriostats Fung 111. Report of committee D-14 on adhesives Plas 124. The biological deterioration of plastics Plas 125. Subsurface environmental elements and their possible relationships to surface "slicks" Misc 89. Water conditioning for recirculating cooling tower systems Misc 98. Crystallinity of wood cellulose fibers studied by x-ray methods Wood 110. The stability of electrical insulation materials toward attack by mold fungi Elec 38. Microbiological corrosion protection by germicidal zone and protective coating Met 212. Technology of corrosion of underground constructions Met 217.

Ceramics, Cements, Glass, and Plaster

Effects of aging on the compressive properties of glass-fabric-base polyester laminates (nine years in a normal atmosphere) Plas 117. Thermal insulation and the external corrosion of underground heat lines Met 216.

Fungicides and Other Toxic Compounds

Improvements in and relating to thermoplastic materials Plas 116. The chemical and mechanical deterioration of wood in contact with iron. Effect of some wood preservatives Wood 109. Proceedings of the fifth annual meeting of the committee for the protection of timber against marine organism attack Wood 112. Di(phenylmercuric)-ammonium propionate—a new slime control agent Wood 114. Harbor screening tests of marine borer inhibitors Wood 115. Deterioration and conservation of paper. Biological deterioration Wood 116. Wood decay in houses, how to prevent and control it Wood 116. Progress in wood preservation Wood 117. Fungicides for concrete fuel tank linings Cer 44. Pentachlorophenol and dodecylpentachlorphenol as mildew preventives for cotton Text 73. Microbiological corrosion protection by germicidal zone and protective coating Met 212.

PVA latex paints for external coatings Lac 67. Anti-fouling coatings Lac 74.

Lacquers, Paints, and Varnishes

The preservative treatment and staining of shingles Wood 109. Tin plated cans sprayed with soluble oil formulation show increased rust resistance Met 211. Thermal insulation and the external corrosion of underground heat lines Met 216. Method and composition for providing a corrosion-resistant coating on aluminum and alloys thereof Met 223.

Metals

The mechanical deterioration of wood in contact with iron Wood 107. The chemical deterioration of wood in contact with iron Wood 108. The chemical and mechanical deterioration of wood in contact with iron. Effect of some wood preservatives Wood 109. Studies in reinforcemement-concrete bond Cer 43. Molybdate pigments: New corrosion inhibitors Lac 69. Polyesters as corrosion-resistant coatings Lac 70. Minimum paint film thickness for economical protection of hot rolled steel against corrosion Lac 71. Painting of welds Lac 73.

Packaging and Storage

Evaluation of protective properties of vapor phase corrosion inhibitors Met 219.

Plastics, Resins, Rubbers, and Waxes

Heat-aging behavior of clay-loaded butyl insulation Elec 33. Plastic coatings for electrical insulation Elec 35. The stability of electrical insulation materials toward attack by mold fungi Elec 38. Fungicides for concrete fuel tank linings Cer 44. Cure cover for concrete Cer 46.

Textiles and Cordage

Textile resistance test. Chemical Specialties Manufacturers Association. Determination of resistance of textile to insect pests, 1961 revision Fung 108.

Wood and Paper

List of publications on structural sandwich, plastic laminates, and wood-base aircraft components available from the forest products laboratory Plas 126. Forest products laboratory natural finish Lac 68. The durability of exterior clear finishes for timber Lac 72.

1961 Biol 75
Vol.18 PDL-39433

Pestinskaya, T. V.
ON THE INTERRELATIONS OF SOME SOIL FUNGI (in Russian)
Botan. Zhur. 43:1270-1277 (September 1958)

Among plant pathogenic microorganisms, the most difficult to control are those which can survive in the soil as saprophytes. Such pathogens could possibly be effectively controlled by biological methods. Some experimental data are given concerning the antagonistic effects of a number of soil saprophytic fungi on one of such half-parasites, Fusarium avenaceum (Fr.) Sacc., var. herbarum (Corda) Sacc. The saprophytic fungi tested were isolated from the same soil as the pathogen.

Antagonism can be classified into two main types: fungistatic and fungicidal. The first type includes alimentary antagonism (inhibition of growth due to the utilization of nutrients by the antagonist), space antagonism (inhibition of growth by the "crowding" effect), and antibiotic antagonism (production of fungistatic substances). Fungicidal antagonism can be saprophytic (production of fungicidal substances) or parasitic (destruction of the parasitized organism by the antagonist).

The effects of saprophytic soil fungi on Fusarium were tested by three methods: simultaneous inoculation of the test organism and of the antagonist on solid Czapek's medium; inoculation of Fusarium on agar plates containing metabolic products and spores of the antagonist (obtained by filtering liquid cultures through filter paper and adding the filtrate to the agar medium); and inoculation of the antagonist on a well developed growth of Fusarium, which was removed from a liquid culture and placed in a sterile container.

Among 114 species and strains of soil fungi tested by the first method, 17.6% showed alimentary fungistatic antagonism toward Fusarium, 64% space fungistatic antagonism, 7% antibiotic fungistatic antagonism, and 6.1% fungicidal parasitic antagonism. No fungicidal saprophytic antagonism was observed. Results obtained by the second test method (which serves to determine

more precisely the type of fungistatic antagonism) showed that Trichoderma lignorum is an alimentary antagonist, Gliocladium salmonicolor a space antagonist, and that several Penicillium species produce fungistatic substances. The third method, which serves to determine parasitism, revealed that Botrytis densa is able to destroy completely the mycelium of Fusarium. Periconia felina, although able to attack the growth of Fusarium, caused only its partial destruction. Penicillium species did not grow on Fusarium. The effects of saprophytic fungi were partly offset by the antagonism of Fusarium toward a number of species. However, considering the large number of saprophytes in soil, as compared with the number of Fusarium species and strains, an accumulation in soil of saprophytes can be assumed to contribute to the inhibition of growth of Fusarium.

Soil, fungi, biocontrol, ecology, foreign

PDL-39432

Milkhiker, M. A., and M. A. Daskal
FUNGI IN SOLUTIONS (in Russian)
Priroda 48:117 (November 1959)

The growth of fungi in strongly alkaline chemical laboratory reagents is reported. An open flask with 0.48 N sodium carbonate solution contained hyphae and sporangia of a fungus, identified as Cephalosporium acremonium. The organism grew at the bottom of the flask, where a precipitate, consisting of salts of calcium, iron, etc., accumulated. Two other fungi, Spicaria violacea and Cladosporium herbarum, were identified in a 0.1 N aqueous solution of potassium thiocyanate.

Fungi, Cladosporium, Spicaria, growth, aqueous, chemicals, foreign

1961 Biol 77
Vol.18 PDL-40320

Morton, A. G. (Imperial Chemical Industries Ltd. Akers Research Laboratories, Welwyn, Eng.)
THE INDUCTION OF SPORULATION IN MOULD FUNGI
Roy. Soc. (London), Proc. 153B:548-569 (February 1961)

Sporulation of Penicillium griseofulvum is rapidly induced in submerged conditions when mycelium is placed in a medium containing a high concentration of glucose but without assimilable nitrogen. External Mg^{2+}, K^{+}, and PO_4^{3-} are required for sporulation. In these conditions, the induction of sporulation is completed in 3 to 4 hr, before any sign of conidiophore formation is observed. Glucose can be effectively replaced by an equivalent concentration of a nonassimilable sugar (sorbose, D-arabinose), provided a small amount of glucose is present to supply the energy requirements of the fungus. High concentrations of salts are not effective and tend to inhibit sporing. Induction of sporing in submerged conditions is inhibited by certain concentrations of ascorbate, Hg^{2+}, cetyltrimethylammonium bromide, and 3,4-dichlorphenylserine which do not affect vegetative growth.

Most powerful stimulus to sporulation in Penicillia and other fungi comes from emergence from submerged into aerial conditions. Experiments with P. griseofulvum and P. chrysogenum show that emergence of the mycelium causes a sharp change in physiological behavior which is manifest before any morphogenetic changes are apparent. Aerial mycelium assimilates NH_4^{+} in the complete absence of external carbohydrate, whereas submerged mycelium does not, even when fully aerated. The aerial stimulus is not associated with oxygen supply, carbon dioxide concentration, or water loss from the mycelium.

Evidence from three independent methods of investigation points to occurrence of a change in physical condition of the cell surface within a few seconds after mycelium emerges from a liquid medium into air. Change increases slowly with time in aerial conditions, and, like aerial sporulation itself, is reversed or

delayed by rewetting. The primary aerial stimulus to sporulation is believed to be associated with some physical change at the cell surface caused by abrupt formation of an air/water interface.

Fungi, Penicillium, reproduction

PDL-40398

Hiatt, C. W. (U. S. National Institutes of Health)
THEORETICAL CONSIDERATIONS IN THE ULTRA-VIOLET IRRADIATION OF MICRO-ORGANISMS
Nature 189:678. (February 1961)

Microorganisms, ultraviolet, mortality, mathematics, theory

1961 Cer 43
Vol.18 PDL-40234

Roberts, J. A., and H. E. Vivian (Australia. Commonwealth Scientific and Industrial Research Organization. Chemical Research Laboratories, Melbourne)

STUDIES IN REINFORCEMENT-CONCRETE BOND. I. IMPROVEMENTS IN BOND

Australian J. Applied Sci. 12:104-130 (March 1961)

The frictional bond between steel bars and concrete is considerably increased by coating steel with an air-or thermal-setting and hardening resin, and either casting the concrete around the treated reinforcement before the resin hardens or applying sand to the unhardened resin, the resin is then allowed to harden before the concrete is cast. Bond determined by pull-out tests increased up to 500% at various ages up to 84 days after fabrication of specimens.

Improved bond was developed by varying techniques for applying and curing the resin, varying types of steel and their surface treatments, varying mixtures of epoxy resin and hardeners, as well as sand particle sizes and fillers. Failure of bond on untreated steel was rapid, whereas on resin-coated and sanded bars it was slow even at high steel stresses. Slip before failure was small with untreated steel, but large with treated steel due probably to high friction bond. When cure of both resin and concrete was satisfactory steel stress invariably increased rapidly with respect to slip; failure occurred generally at a very slow slip. As specimens aged, the bond continued to increase and the measured slip at failure tended to decrease slightly. Bars withdrawn from specimens revealed that failure occurred either in cement paste or at the steel-resin bond. Bars that received heat-cured resin treatments generally failed in the cement paste at all ages, whereas coated and air-cured resin treated bars sometimes failed at the steel surface, especially at early ages, but usually failed in cement paste at later ages. Various hardeners could be used to suit curing temperatures and working times and may be adapted to overcome premature failure under unusual working conditions.

Concrete mix was 1 : 2 1/2 : 4 cement:sand:screenings.

The water/cement ratio was 0.60 by wt and the slump approximately 2 in. Cement was a typical portland cement. Steel bars were of various types and sizes. Resin treatment was basically Epikote No. 828 hardened with 8 parts of diethylenetriamine per 100 parts resin.

Concrete, steel, reinforcement, adhesion

PDL-40352

U.S. Naval Research Laboratory (J. R. Griffith)
FUNGICIDES FOR CONCRETE FUEL TANK LININGS (TYPE 53)
Memorandum Report 1151 (March 1961) 7 p.

Finely divided copper 8-quinolinolate, p-toluenesulfonamide, or trinitrobenzene may be incorporated as a fungicide in Type 53 lining (a blend of polysulfide latex and saran latex, NAVDOCKS Spec. 47Yb). Apart from copper 8-quinolinolate, which may be added several days before use, the agents are admixed as dry powders not more than 24 hr before application of the latex.

In view of the relative immunity of Type 53 lining to fungal attack, fungicide levels should not exceed 1.0% of the weight of resin solids pending determination of the effects, if any, of the additives on fuels. The fungicidal/bactericidal efficacy of additions of 1 oz finely divided metallic silver to 100 gal Type 53 latex is under study.

Tanks, concrete, fuel, coatings(organic), elastomers, aqueous, fungi, toxic, copper 8-quinolinolate, p-toluenesulfonamide, trinitrobenzene

1961 Cer 45
Vol.18 PDL-40233
Roberts, J. A., and H. E. Vivian (Commonwealth Scientific and Industrial Research Organization. Chemical Research Laboratories, Melbourne.)
THE WIDENING OF EXPANSION CRACKS IN MORTAR BY SALT SOLUTIONS
Australian J. Applied Sci. 11:481-489 (December 1960)

A new mechanism by which pre-existing cracks in mortar are enlarged and the specimen expanded by salt solutions is described. Mortar specimens are molded from 1 part high alkali cement and 2 parts reactive aggregate and stored over water in sealed containers and allowed to crack and expand. After cracking and up to 12 mo after manufacture they are treated by grouting or soaking in various solutions. Expansion and changes in widths of cracks are measured from embedded end points.

Major expansion occurs within 1 hr after treatment. Salts containing di- or trivalent positive ions cause markedly greater expansions than those containing monovalent positive ions. The particular divalent positive ion is not significant. Trivalent aluminum, however, tends to be precipitated, thus reducing its expansive effect. Maximum expansion is not markedly affected by the valency or the nature of the negative ions. Pressure grouting apparently is not the cause of expansion. Widths of the cracks are affected by grouting and a solution of calcium nitrate causes a greater expansion and affects more cracks than any other treatment. Prior grouting with surface active agent solution causes a marked reduction in expansion by subsequent treatment with calcium nitrate solution. The effect of water and surface active agents in modifying expansion caused by calcium nitrate solution appears to be due to their protective action on the crack surfaces.

Expansion of cracked concrete by salt solutions is permanent and inelastic. The general reduction in cohesiveness implies acceleration in the rate of disintegration of concrete exposed to environmental actions such as frost and mechanical (traffic) action. The application of calcium chloride to hardened concrete pavement to deice them or to freshly placed concrete

to assist curing may greatly accelerate deterioration by expanding preexisting cracks, as well as by causing true chemical attack of the hydrated calcium aluminates in cement.

Cement products, expansion, cracking, aqueous, salts, mechanism

PDL-40305

Funk, William U. (U. S. Industrial Chemicals Co., New York, N.Y.)
CURE COVER FOR CONCRETE
Modern Plastics 38(8):93,172 (April 1961)

The impermeability, flexibility, lightness, and reflectance of opaque white 4-mil polyethylene film make it an excellent cover for curing concrete. By close contact, it minimizes air spaces and maintains a uniformly moist surface; it is unaffected by rain or mildew, and can be used successfully an average of 6 times. Core tests show slightly greater compressive strength in concrete cured under polyethylene than under waterproof paper.

Film is available in lengths to 1500 ft and in widths to 24 ft; this eliminates overlaps. Two men can handle a 200-ft roll of 14 ft width. Sawed joints in rigid pavements are covered with 2 1/2 in. wide tape (bearing twin ribbons of adhesive mastic on one side) which keeps moisture in, and foreign matter out of the joint. Clear 1-mil film is used as a moisture barrier under slab concrete.

Concrete, setting, shield, polyethylene, film

1961 Cer 47
Vol.18 PDL-39809

Kaufman, Stefan, Wilhelm Król, Edward Lebda, and Tadeusz Wojtan

HARDENING OF CONCRETE AT SUBFREEZING TEMPERATURE (in Polish)

Materialy Budowlane 12:321-330 (November 1957)

An experimental study was made to determine conditions under which concrete, exposed for prolonged periods of time to low temperatures, will have the minimum required compression strength upon thawing. Samples of concrete in the form of cylinders, 16 cm long and 16 cm in diameter, and in the form of 25 x 25 x 25 and 30 x 30 x 30 cm cubes were prepared with three Polish cements (portland cement 350, portland fast-hardening cement 400, and a bauxite cement) and with one imported (Russian) bauxite cement. Samples made with the portland cements contained 0 to 5% calcium chloride. Before mixing, the components of concrete were brought to temperatures ranging from 18 to 60 C. The samples were then exposed to temperatures of -10 to -15 C for periods sufficiently short to prevent the temperature within the concrete from dropping below -1 to -3 C. Depending on the composition of the concrete and the initial temperature of its components, the exposure time varied from less than 1 hr to 2 days. Compression strength was measured upon thawing and for some time thereafter.

Concrete samples made with portland cements reached an average compression strength of 67 kg/sq cm before their temperature dropped to around 0 C, and a maximum strength of about 100 kg/sq cm after thawing. The maximum compression strength, developed before freezing for samples containing 5% calcium chloride and mixed at 60 C, was 98 kg/sq cm. Concrete made with domestic bauxite cement developed a compression strength of 195 to 207 kg/sq cm before freezing, even when mixed at 18 C. When allowed to harden at room temperature, such concrete reached a strength of 214 kg/sq cm within the same period of time (45-57 hr). The small difference between the compression strength of the normal and low temperature-hardened bauxite concrete can be explained

by its high caloric value. Limited data indicate that the imported bauxite cement had similar properties.

Concrete, setting, low temperature, mechanical properties, foreign

PDL-40235

Roberts, J. A., and H. E. Vivian (Australia. Commonwealth Scientific and Industrial Research Organization. Chemical Research Laboratories, Melbourne)
STUDIES IN REINFORCEMENT-CONCRETE BOND. II. BEHAVIOUR OF REINFORCEMENT-CONCRETE BOND IN THE PRESENCE OF CALCIUM CHLORIDE ADDITIVE AND UNDER STEAM-CURING CONDITIONS
Australian J. Applied Sci. 12:131-139 (March 1961)

The effect of 2% calcium chloride additions to concrete as well as the effect of steam curing on the improvement of bond between concrete and resin coated steel were studied by pull-out tests.

Steam curing alone accelerates the hardening of uncured resin coatings and increases the bond by increasing the resistance of the cement paste or mortar to deformation or shear. Calcium chloride addition alone appears to increase the resistance of cement paste or mortar to deformation or shear and therefore improved bond. Steam curing and calcium chloride addition to concrete when used together increase bond satisfactorily. Increases up to 500% over that of untreated steel were observed at various ages up to 84 days.

Steel embedded in steam cured concrete which contains calcium chloride is severely corroded. Under the same conditions corrosion of resin treated steel is markedly reduced. The major modification being a thin, adherent, bluish black oxide film.

Slip is usually greater for steam cured than for moist air-cured specimens, probably because steam curing modifies the hydrated cement in such a way as to increase the frictional bond. Addition of calcium chloride on the other hand appears to increase the rigidity of the paste and the adhesional bond without

increasing the frictional bond.

Rapid increase in steel stress at very small slip was observed with adequately cured resin coated treatments. When steel was resin coated, then sanded with air or heat curing, there was less rapid increase in steel stress together with a long period of slip.

The concrete used was a standard 1 : 2 : 4 mix by wt, water/cement ratio was 0.6 by wt. Coating was an epoxy resin (Epikote 828) hardened with 8 parts diethylenetriamine.

Concrete, reinforcement, steel, coating(organic), calcium chloride, corrosion, adhesion

PDL- 40011

U.S. Wright Air Development Center (Illinois. University - Julian H. Lauchner, Dwight G. Bennett, and George L. Morgan)
NONDESTRUCTIVE TESTS FOR CERAMIC, CERMET AND GRAPHITE MATERIALS
Technical Report 59-412; ASTIA Doc. 236674 (November 1959) 52 p.

Ceramics, cermet, graphite, tests, defects, stress, mechanical properties, techniques

1961 Elec 33
Vol.18 PDL-40344

Craig, David N., and John P. Schrodt (to U. S. Secretary of the Navy)
LOW-TEMPERATURE DRY CELL
U.S. Pat. 2,950,999; August 30, 1960. 3 p.

Dry cells retaining normal efficacy at -20 to -50C are practicable with an aqueous electrolyte containing 17 to 50% (preferably 47%) methylamine hydrochloride, 10 to 20% (preferably 15%) ammonium chloride, and up to 10% (preferably 3%) zinc chloride. Type D-size cells made with this electrolyte are as uniform in voltage and more uniform in flash current than equivalent commercial cells; room-temperature voltage and amperage are comparable, and shelf life is satisfactory. At 40 C, voltage averages 1.5 v; flash current, 2.14 amp.

Hydrochloride salts of other simple amines may be substituted for the methylamine. At lower temperatures, the ammonium chloride (essential for electrolyte stability and adequate shelf life) crystallizes and the methylamine hydrochloride solution assumes a more important role.

Batteries, low temperature, electrolyte

PDL-38756

Rodriquez, F., and C. C. Winding (Cornell University)
HEAT-AGING BEHAVIOR OF CLAY-LOADED BUTYL INSULATION
(n.d.) 14 p.

In a development study seeking optimum formulation of a quinoid-cured, calcined clayfilled butyl, mechanical and electrical effects in variously aged specimens of additions of stearic acid, polyvinyl stearate, benzoic acid and five polyolefins were investigated. Base material was 100 parts by wt butyl rubber, 5 zinc oxide, 2 quinone dioxime, 4 benzothiazyl disulfide and 7.5 red lead.

Addition of stearic acid reduces the tensile strength of compounds aged to 5 days at 250 F, but improves retention of elongation. Polyvinyl stearate also impairs tensile retention. At equivalent concentration

benzoic acid is less injurious, but makes processing difficult. In unaged compounds, polyolefins generally decrease ultimate elongation, but affect ultimate tensile little. Modulus at 200% elongation is invariably increased by addition of linear polyethylene (LPE), its copolymers, or polypropylene: 10 parts LPE in the presence of various fillers doubled the modulus giving unmodified moduli of 150 to 800 psi.

Tensile strength of LPE compounds increases markedly, however, with air-baking up to 21 days at 250 F (although cures longer or at higher temperatures than the standard 30 min at 300 F effect no such increase), and without further loss in elongation. Aging in water at 194 F has a comparable effect on strength and a mixed effect on elongation, as does the substitution of talc or thermal black for clay. The LPE additive has little or no effect on power factor and dielectric constant; and little or none on volume resistivity, even after long aging.

Volume swell characteristics (in xylene and cyclohexane) are discussed without conclusion as to the nature of the LPE-butyl association.

Electric insulation, Butyl, aging, temperature, formulation, mechanical properties, electric properties

PDL-40253

Thym, G. C. (Joy Manufacturing Co., Pittsburgh, Pa.)
NEW DESIGN APPROACHES NEEDED FOR GROUND POWER CABLE
Space/ Aeronautics 35:79-80, 82, 88, 90 (April 1961)

Cable, design, insulation, failures

PDL-38704

U.S. Rome Air Development Center.(Pennsylvania University. Institute for Cooperative Research.)
CRYSTAL DETERIORATION STUDIES
Technical Report 58-95; ASTIA Doc. 148811 (April 1958) 163 p.

Electric devices, crystals, burnout

1961 Elec 35
Vol.18 PDL-40241

Pascoe, W. R. (Polymer Corp., Reading, Pa.)
PLASTIC COATINGS FOR ELECTRICAL INSULATION
Elec. Eng. 80:360-363 (May 1961)

The fluidized bed process effects single-dip plastic coatings at readily controlled 5 to 50-mil thicknesses with greater uniformity and lower cost than multiple solution coating. Metal parts of almost any configuration can be coated with cellulosics, vinyls, epoxies, nylon, polyethylene, or chlorinated polyether; the first three are preferred electrical coatings. The part is plunged while hot, into a bed of finely divided fluidized plastic powders; coating thickness depends on surface temperature and heat content of the part, and time of immersion (a few sec). Curing time, if any, depends on nature of coating. Typical total cycle time is less than 20 min. Cost is not directly competitive with solution finishes involving 2 coats, but is generally more economical than 3 or more coats.

Coating thickness closely follows contours--even sharp corners--and virtually eliminates excessive buildup. Exceptional uniformity is demonstrated by dielectric testing; comparison of local-electrode with general-electrode (wet blanket) results shows uniformity factors of 61% (with a cellulosic) to 96% (with a vinyl). Close tolerance coatings can be machined.

Cellulosics combine adequate insulation (1000 v/mil) at low frequencies with exceptional weathering and impact-abrasion resistance. Vinyls have similar dielectric properties, and better chemical and thermal resistance than cellulosics; plasticity varies with grade of vinyl used. Epoxies provide exceptionally good insulation, particularly at elevated temperatures and humidity; chalking (with consequent moisture absorption) and weathering is a disadvantage. Nylon coatings combine fair dielectric strength with good wearing qualities. Polyethylene offers low water absorption, excellent chemical resistance, and good electrical properties. Chlorinated polyether coatings

provide good low-frequency insulation in highly corrosive environments.

Electric insulation, coatings(organic), vinyl, polymers, cellulosics, nylon, polyethylene, epoxies, procedure

PDL-39943

Radio Corp. of America. Electron Tube Division, Harrison, N.J. (E. R. Schrader)
A STUDY OF ELECTRON TUBE DETERIORATION UTILIZING KINETIC THEORY
Quarterly Report 3; (January 1-April 1, 1960) ASTIA Doc. 235319. 87 p.

Results of life-testing (to 2000 hr) of factory-produced 5814-A electron tubes presented in terms of a kinetic deterioration scheme indicate validity of the kinetic concept. Life test conditions for specially made tubes of this type are described.

Gas evolution tests with three plate materials give activation constants which, when computed statistically, accord with the literature. Individual results, however, are erratic. An improved processing schedule is discussed.

The deteriorative role of sublimation is considered, and analyses by x-ray fluorescence emission spectrometry of electrode, mica and bulb deposits in 5814-A tubes are presented. Processing and activation factors also are discussed.

Electronic equipment, electron tubes, service life, tests

PDL-40553

Diebold, E. J. (International Rectifier Corp., El Segundo, Calif.)
POWER RECTIFIER TAKES SEVERE ENVIRONMENT
Electronics 34(23):124-, 126-127 (June 1961)

A beam power supply (for klystron transmitting tubes) rectifier for continuous operation in extreme

climates is described. For a supply of 30,000 v, 9 amp, rectifier elements are rated 70,000 v, 400 amp peak. Elements contain a large number of identical silicon rectifier cells connected in series; operation can continue with a plurality of failed individual elements without detriment to operative cells, except by the proportional increase in mean voltage per cell. An elastic voltage divider network takes care of voltage shifts by cell failure. Electrically reversible elements are self-contained, hermetically sealed unitary structures.

Cells and hardware are combined in a rectifier module, assembled and in-line tested as one component. Bolted-joint assembly into the complete structure minimizes stressing of modules. Element tanks (16 x 16 x 60 in.) are all-metal except for two ceramic terminal insulators; they are grounded, self-cooling, self-supporting, and able to withstand shake tests, operation or storage from -65 to +105 C. Without forced cooling, full-load temperature rise of active parts (immersed in askarel) over ambient air is not more than 40 C.

Active parts are mounted on an epoxy-fiberglass tube held between large ceramic, high-strength insulators. A large steel spring holds the entire internal structure under axial compression greater than any applied dynamic force; the electrostatic screen is under equivalent tensile stress. The structure is thus immovable by shock or vibration, but readily absorbs thermal expansion. To prevent overheating failures resulting from current surges, the silicon rectifier cells are made from alloyed junctions, 0.06 sq. in., capable of 40 times the rated current for 50 msec without affecting voltage recovery. Mounting, cooling, and interconnections are designed for surge loads.

Electromagentic waves from outside the tank are shielded by heavy aluminum walls; their residue is shielded by a tapered-cylinder, high conductivity Faraday screen. All electric gradients are held low (and high voltage effects eliminated) by using the capacitors and resistors in the rectifier modules as a voltage dividing ladder, to which all metallic parts are tied. Design load of ceramic support insulators and feed-through insulators is 180,000 v.

Electric devices, rectifier, lower temperature, high temperature, design Deterioration

NRC

1961 Elec 38
Vol.18 PDL-40081

Al'bitskaya, O. N., and N. A. Shaposhnikova
THE STABILITY OF ELECTRICAL INSULATION MATERIALS TOWARD ATTACK BY MOLD FUNGI (in Russian)
Vestnik Elektroprom. 30:54-59 (October 1959)

The resistance of dielectric materials and of their components to fungal attack under conditions simulating a tropical environment (30 C and 95 to 100% RH) was tested by two methods: (1) samples contaminated with fungal spores were in contact with nutrient substances, and (2) the samples were the only source of nutrient for the contaminating fungi. Test fungi were: Stachobotrys atra, Aspergillus niger, A. amste lodami, Penicillium cyclopium, P. brevicompactum, Paecilomyces varioti, and Chaetomium globosum. In the first method, samples were inoculated either by spraying with spore suspensions in Czapek medium, by covering the sample surface with agar-solidified malt extract containing metabolic products of the fungi and their spores, or by placing the samples on the surface of malt-extract agar, then spraying them with spore suspensions. In the second method, the samples were inoculated with spore suspensions in distilled water. The incubation time was 28 to 60 days.

When the dielectrics were in contact with nutrients, fungal growth was observed on all samples, with the exception of those containing fungicides. In some materials, changes resulted from metabolic activity of the fungi, e.g., transparent polycaprolactam film was permanently discolored. When tested in the absence of nutrients, some commonly used electric insulation materials were found susceptible to fungal attack. Generally, the degree of susceptibility varied with the chemical nature of the materials. The degree of resistance was evaluated by the absence of growth or, in its presence, by its relative amount. Polymeric materials such as polyethylene, polystyrene, nonplasticized poly(vinyl chloride), polyfluoroethylene, polyamides, polymethacrylate, and synthetic rubbers did not support growth. Natural rubber and materials based on natural rubber were highly susceptible. Poly (vinyl

acetate) supported limited growth but became fully resistant after preliminary heat treatment at 125 to 150 C. Pure polyester resins were resistant, but were attacked by the fungi when modified with vegetable oils (particularly tung oil, castor oil, and linseed oil). Urea-formaldehyde resins, high-temperature urea-melamine resins, phenolic resins, and epoxy resins were resistant. Cellulose derivatives supported weak growth, but after prolonged incubation underwent extensive degradation. Mineral fillers were not attacked, and had no effect on the biological resistance of dielectric materials. Organic fillers (wood meal, cotton, paper) were degraded rapidly. Several bituminous materials also were susceptible.

Electric insulation, fungi, polyethylene, poly(vinyl chloride), polyamides, polystyrene, elastomers, rubber, poly(vinyl acetate), urea-formaldehyde, phenolics, fillers, polymers, epoxy

1961 Fung 101
Vol.18 PDL-39752

ENZYMATIC FUNGICIDES SHOW PROMISE
Chem. Eng. News 38(22):42-43 (May 1960)

Some fungus cells are protected by a sheath of chitin which may account for their unusual resistance towards chemical fungicides. The complex polysaccharide enzyme, chitinase, specifically attacks chitin in the fungal cell wall. The chitin is quickly hydrolyzed and the cell wall ruptured, thus the extruding protoplast is killed naturally by exposure to air. The enzyme apparently does not harm the plant host and is nontoxic to humans. A solution containing as little as 0.1 ppm of chitinase completely inhibits spore germination of Aspergillus niger. The effectiveness is not limited to this one organism but should apply to any fungal cell protected by chitin. Chitinase occurs naturally in such widely diverse places as the lawn-variety puff ball, almond "skin", the intestinal fluid of some insect eating creatures and in some bacteria. The chemical configuration as yet is undetermined. It oxidizes rapidly and must be kept refrigerated and under toluene.

Fungi, toxic, enzymes

PDL-40406

U.S. Fish and Wildlife Service. Branch of Predator and Rodent Control, Lafayette, Ind.
CONTROLLING STARLINGS
Leaflet No. 209 (January 1961) 2 p.

Bird, biocontrol, toxics, techniques

PDL-40405

U.S. Fish and Wildlife Service. Branch of Predator and Rodent Control, Lafayette, Ind.
CONTROLLING PIGEONS
Leaflet No. 205. (March 1961) 2 p.

Bird, biocontrol, toxics, technique

1961 Fung 102
Vol.18 PDL-40002

Atomic Energy of Canada Ltd., Chalk River, Ont., Can.
(R. E. Manson and I. L. Ophel)
EXPERIENCE WITH SLIME FORMING ORGANISMS IN CHALK RIVER REACTOR SYSTEMS
Report AECL-1124; Report CR10-950 (September 1960) 21 p.

Incidence and prevention of slime formation in atomic reactor cooling and storage systems by algae-fungi and bacteria of Ottawa River water were studied.

Flocculation of raw water normally removes most of the organisms. Subsequent infection of closed circuit cooling systems and open-trench systems is controlled by chlorination, except in corrosion-susceptible aluminum systems. Sodium dichromate at 120 ppm sterilizes a distilled water closed cooling circuit contaminated with Pseudomonas. In laboratory tests zephiran chloride and sodium hypochlorite gave satisfactory results.

Slime, consisting mainly of long filaments of a chain forming "sulfur bacterium" resembling Thiotrix, and of diatom shells, was removed from heat exchangers by 8-hr static treatment with 2% citric acid--0.5% household detergent; intermittent chlorination prevents recurrence of fouling. Open-trench systems, (e.g., rod storage bays) require continuous purification of the water by circulation through filters and ion exchange units; walls and floors are vacuum-cleaned, and the surface is skimmed periodically. Reduction of light intensity reduces algal growth.

Reactors, water systems, slime, bacteria, sulfur, toxic

PDL-40419

THE PEET-GRADY METHOD. OFFICIAL METHOD OF THE CHEMICAL SPECIALTIES MANUFACTURERS ASSOCIATION FOR EVALUATING LIQUID HOUSEHOLD INSECTIDES, 1961 REVISION

Soap Chem. Specialties, Blue Book, 1961. p.237-239.

Insects, toxics, tests, standard

1961 Fung 103
Vol.18 PDL-39956

Neeman, Moshe (to Wisconsin Alumni Research Foundation, Madison, Wis.)
INSECTICIDAL COMPOSITIONS
U.S. Pat. 2,974,083; March 7, 1961. 6 p.

DDT is powerfully synergized by adding (per part DDT), 0.025 to 10 parts by wt p-chlorobenzenesulfonic acid-N-di-(R)-amide, where R represents an ethyl, n-propyl, n-butyl, n-amyl, n-hexyl, or n-heptyl. The synergists are colorless, odorless, tasteless, adequately soluble in common DDT solvents, virtually insoluble in water, long-lasting, and practically innocuous to plants and warm-blooded animals. They enable reduction of DDT levels to 2 to 3 %.

DDT, insect, toxic, synergism

PDL-40407

U.S. Fish and Wildlife Service. Branch of Predator and Rodent Control, Lafayette, Ind.
CONTROLLING BIRDS. BIRD CONTROL IN FOOD STORAGE AREAS AND PIGEON TRAP PLAN
n.d. 2 p.

Birds, biocontrol, techniques

PDL-40408

U.S. Fish and Wildlife Service. Branch of Predator and Rodent Control, Lafayette, Ind.
CONTROLLING BIRDS. ENGLISH SPARROWS.
March 1960. 2 p.

Birds, biocontrol, calcium cyanide, fumigant, toxics

1961
Vol.18

Fung 104
PDL-40062

Virginia-Carolina Chemical Corp., Richmond, Va. (Manlio Arthur Manzelli, et al.)
MEANS FOR PROTECTION OF FOODSTUFFS AND OTHER MATERIALS FROM DEPREDATION BY RODENTS
Gt. Brit. Pat. Spec. 841,720; July 20, 1960. 4 p.

Rodents are effectively repelled from containers, structures, and structural materials by treatment with certain furan derivatives, of which ethyl 2-furoate tetrachloride is typical. The repellent is applied at 1 to 5 gm/sq in.: (1) in ethanol or other organic solvent; (2) diluted with an inert powder; (3) from solution or aqueous emulsion of poly(vinyl chloride) or poly(vinyl acetate); or (4) from aqueous mixture with isopropyl alcohol and zein. The repellent need not come in contact with the material to be protected. Seedlings and trees also are protected by direct application, and seed grain directly mixed with the repellent is protected both during storage and after sowing. The term 'rodents', used here, includes the rabbit family.

Rodents, repellents, patent

PDL-40318

Odeneal, John F. (Food Machinery and Chemical Corp. New York, N.Y.)
INSECT RESISTANCE SURVEY-II
Soap Chem. Specialties 37:103, 105, 107 (May 1961)

A nation-wide survey reveals continued general increase in insect resistance to insecticides from 1958 to 1960. Increased house fly resistance to methoxychlor, lindane, chlordane, dieldrin, and diazinon is reported; house fly resistance to DDT remains universal. Roach resistance to chlordane, dieldrin, methoxychlor, and lindane is more widespread. Decrease in reports of fly resistance indicates acceptance of newer techniques; many successful substitutions of pyrethrins and synergized pyrethrum are reported.

Insect, toxics, resistant strains, cockroaches
Deterioration
NRC

1961 Fung 105
Vol.18 PDL-38738

Establissements Sergent Laboratoires Prolac, Surgeres (Charente Maritime), France (Jean Ploquin)
ANTIFUNGAL COMPOSITIONS AND PROCEDURE FOR PROTECTING ARTICLES THEREIWTH
Gt. Brit. Pat. Spec. 827, 434; February 3, 1960. 10 p.

The compositions comprise in combination: (a) at least one member of the group consisting of the oxygenated acid and anhydride derivatives of boron, their salts and esters in the proportion of 3 to 15% of the product; (b) at least one organic compound in the proportion of 0.2 to 5 mols per mol of boric anion incorporating two identical or different radicals of the OH, NH_2 and NH group, these two radicals being in the positions α and β to one another; (c) an organic or mineral base in an amount sufficient to give the product a pH of 9 or above. Suitable components are listed. They are mixed in the order (a + b) + c, preferably at boiling point. The compositions may be used as such, in solution, absorbed in earthy vehicles, or incorporated in emulsions or pigments for protection of fresh fruit, tobacco and cheese. A typical composition comprises 100 gm boric acid, 90 gm lactic acid, 715 g triethanolamine and 95 gm water.

Fungi, toxic, boron compounds, patent

PDL-40420

OFFICIAL METHOD OF CHEMICAL SPECIALTIES MANUFACTURERS ASSOCIATION FOR EVALUATING AEROSOL AND PRESSURIZED SPACE SPRAY INSECTICIDE FOR FLYING PESTS, 1961 REVISION
Soap Chem. Specialties, Blue Book, 1961, p. 244-246, 287.

Insects, toxics, aerosol, tests, standard

1961 Fung 106
Vol.18 PDL-40422

COCKROACH AEROSOL TEST METHOD. TENTATIVE OFFICIAL METHOD OF THE CHEMICAL SPECIALTIES MANUFACTURERS ASSOCIATION FOR EVALUATING AEROSOLS AGAINST COCKROACHES, 1961 REVISION
Soap Chem. Specialties, Blue Book, 1961. p.247-28, 287.

Cockroach, toxics, aerosol, tests, standard

PDL-39738

Leckey, C. R. (Oxford Paper Co. Research Dept., Rumford, Maine)
THE SLIME BOARD METHOD OF PAPER MILL TOXICANT EVALUATION
n.d. 5 p.

A device for use in the laboratory or on paper machines for the evaluation of toxicants is described. In the laboratory, artificial white water of specified composition is circulated over slime boards. The machine model is attached directly to the machine and uses machine white water. The artificial medium described is specific for the study of a particular type of machine furnish but may be modified for various manufacturing conditions. Microbiological toxicity is determined by making plate counts of the accretion. Laboratory and machine results for three toxicants (not specified) indicate good correlation, but further work is necessary because of insufficient data.

Slime, toxics, paper mill, test equipment

PDL-40423

COCKROACH SPRAY METHOD. OFFICIAL METHOD OF THE CHEMICAL SPECIALTIES MANUFACTURERS ASSOCIATION FOR EVALUATING LIQUID HOUSEHOLD INSECTICIDES AGAINST CRAWLING INSECT PESTS, 1961 REVISION

Soap Chem. Specialties, Blue Book, 1961. p.249-250

Cockroach, toxics, tests, standards

1961 Fung 107
Vol.18 PDL-39170

Hirschfeld, H. (Riedel- de Haën A.G., Seelze, Ger.)
FUNGICIDES IN SURFACE-COATINGS (in German with English summary)
Fette, Seifen, Anstrichmittel 61:1233-1239 (December 1959)

Of a large number of fungicides tested for incorporation in surface coatings, only copper 8-quinolinolate, phenylmercury compounds, chlorinated phenols and organic tin compounds appear practical. Requirements for their use are high activity at low concentrations, harmlessness to paint properties, resistance to ultraviolet light, high temperatures, and weak cleaning agents, insolubility in water, miscibility or solubility in paint ingredients, and lack of odor and human toxicity.

Copper 8-quinolinolate is effective in 0.2 to 0.5% concentration. It is nontoxic, water-insoluble, resistant to 200 C and stable at pH 2 to 12. Its yellow green color, however, excludes the use in white paints. Phenylmercury compounds are active in 0.1 to 0.2% concentration. They have the advantage of being colorless but are more toxic than the copper compound. Chlorinated phenols can be used to a limited extent only, because of their water solubility and yellowing properties. Organic tin compounds are active at 0.1 to 0.2% and are excellent fungicides for oil paints and synthetic resin lacquers.

Toxicity tests and practical experiments have established that it is impossible to ingest mercury from phenylmercury compounds and tin from tin compounds, or that any such compounds are released in the air stream.

Combinations of some fungicides show synergistic effect. For example, only 0.08% of a combination of 40% phenylmercury quinolinolate and 60% copper 8-quinolinolate showed the same activity as 0.2% as phenylmercury 8-quinolinolate alone.

Coating(organic), fungi, toxic, foreign, mercury compounds, tin compounds(organic), chlorinated phenols, copper 8-quinolinolate

Deterioration
NRC

1961 Fung 108
Vol.18 PDL-39385

Yeager, Charles Casper
IMPROVEMENTS RELATING TO BIOCIDAL COMPOSITIONS
Gt. Brit. Pat. Spec. 837,068; June 9, 1960. 8 p.

Mixtures of hexachlorophene and o-phenylphenol in ratios from 1:4 to 4:1 in a water miscible emulsion, at a concentration of 0.03 to 1%, give enhanced efficacy against both fungi and Gram negative and Gram positive bacteria. The compounds, dissolved in an active aliphatic ketone, such as diisobutyl ketone, are admixed in the oil phase of the oil-water emulsion. Addition of a high boiling liquid glycol such as propylene glycol prevents movement of substantial amounts of water into the oil phase and has a synergistical biocidal effect. The composition can be used for preservation of textiles, leather and wood.

Fungi, bacteria, toxic, hexachlorophene, phenylphenol, patent

PDL-40424

TEXTILE RESISTANCE TEST. OFFICIAL METHOD OF THE CHEMICAL SPECIALTIES MANUFACTURERS ASSOCIATION FOR DETERMINING RESISTANCE OF TEXTILE TO INSECT PESTS, 1961 REVISION
Soap Chem. Specialties, Blue Book, 1961. p.240-243

Textile, insect, moths, beetles, wool, tests, standard, procedure

1961
Vol.18

Fung 109
PDL-40552

Bruce, Willis Nels (to Lee Ratner, Miami Beach, Fla.)
INSECTICIDAL REPELLENT
U. S. Pat. 2,981,654; April 25, 1961. 2 p.

Combination of any one or more of the insect repellents di-n-butyl succinate and other n-propyl and n-butyl diesters of maleic, fumaric, and succinic acids with one or more chlorinated hydrocarbon insecticides such as methoxychlor, DDT, and Perthane (diethyldiphenyldichloroethane) greatly enhances the efficacy and stability of both components. Such insecticidal repellents are particularly suited to the control of insects (flies, mosquitoes, cockroaches, ants, and silverfish) in homes and barns, and to the protection of domestic animals, stored grain, and other products. Effective levels are so low as to present no hazard to animals or in animal products.

Insects, toxics, chlorinated hydrocarbons, DDT, methoxychlor, synergists

PDL-39953

Weesner, William E. (to Monsanto Chemical Co.)
BIOLOGICAL TOXICANTS
U.S. Pat. 2,965,538; December 20, 1960. 2 p.

Complexes, formed by reaction of one mole of an (haloaryl)dialkylsulfonium iodide and one mole of a halide of a metal of the I-B and II-B groups, are effective against bacteria, fungi and nematodes. A typical complex is (4-chlorophenyl)dimethylsulfonium iodide with mercuric bromide. They are employed in dusts, aqueous suspensions or organic solvents at 0.0001 to 1.0% carrier. One percent solutions completely inhibited growth of Micrococcus pyogenes var. aureus, Salmonella typhosa and Aspergillus niger.

Fungi, bacteria, toxic, iodine compound(organic), patent, sulfonium compound

1961
Vol.18

Fung 110
PDL-40064

Kosmin, Milton (to Monsanto Chemical Co., St. Louis, Mo.)
COPPER CHELATE COORDINATION COMPLEXES
U.S. Pat. 2,977,279; March 28, 1961. 5 p.

Certain chelate coordination complexes of copper salts with N-alkenylalkylenepolymines [e.g., the reaction product of copper nitrate and N-(tetrapropenyl) diethylenetriamine)] are useful biological toxicants, particularly as fungistats for plants, textiles, furs and leather. Suitable polyamines contain 3 to 5 amino nitrogen groups separated by alkylene chains of 2 to 3 carbon atoms, while the alkenyl radical contains 8 to 18 carbon atoms. Many inorganic and organic copper salts are suitable. Care is necessary in dehydrating the complexes, some of which tend to explode when dried in large batches. Application may be by dusting or from aqueous solution, emulsion or suspension, with or without wetting agents and oily sticking agents. Typical sprays contain 500 to 5000 ppm active compound.

Fungi, toxic, textiles, keratin, leather, copper compounds(organic), patent

PDL-40346

Jezl, James L. (to Sun Oil Co.)
PHENOL SALTS OF POLYESTERAMINES AND THEIR USE AS FUNGICIDES OR RODENT REPELLENTS
U.S. Pat. 2,957,850; October 25, 1960. 2 p.

Certain phenol salts of polyesteramines are effective fungicides, bactericides, rodent repellents, and insecticides, useful for preserving a wide range of organic materials including seeds, wood, leather, textiles, paints, plastics, and waxes. They are applied either in (aqueous or organic) solution or dispersion,

or incorporated in a dust.

Suitable salts are prepared from a fungicidal halophenol and a polyesteramine which is the reaction product of a polybasic acid such as adipic acid or anhydride thereof, with a polyhydroxy amine such as a triethanolamine. A suitable halophenol is pentachlorophenol in an amount sufficient to neutralize substantially all of the nitrogen atoms of the polyesteramine molecule.

Fungi, insects, rodents, toxic, patent, pentachlorophenol, amine

PDL-39955

McCall, Ernest Bryson, and D. A. Lindsay Seiler (to Monsanto Chemicals Ltd., London, Eng.)
MYCOBACTERIOSTATS
U.S. Pat. 2,970,081; January 31, 1961. 3 p.

Certain aromatic hydroperoxides (e.g., cumene hydroperoxide) and their sodium or potassium salts give bacteriostatic properties to soaps, waxes or plastics when incorporated at 0.5 to 5% concentration by weight. The compounds cause no discoloration and may even blanch white soap. They are added to thermoplastic or thermosetting plastic resins before fabrication. Fabrics also are protected. The additives need not be in physical contact with articles to be protected against fungi and bacteria. Effective inhibition of Staphylococcus aureus, Salmonella typhi, and Bacillus mycoides was shown by soaps and waxes containing about 1% by wt cumene hydroperoxide.

Bacteria, toxic, polymers, wax, patent

1961
Vol.18

Lac 67
PDL-40502

Crosby, John N. (Weyerhaueser Co.)
PERFORMANCE OF SOME BLISTER-RESISTANT PAINTS
Forest Products J. 11:255-257 (June 1961)

Nature and causes of paint blistering on wood siding are reviewed. Seven years of service and laboratory testing on red cedar, Douglas-fir, and western hemlock demonstrate superior performance by specifically blister-resistant oil-base paints. Pretreatment with a water repellent also inhibits blistering. Such paints generally employ an alkyd or modified alkyd resin vehicle at > 50% by wt total paint; vegetable oils, copolymer solutions, and dicyclopentadiene resins are also used. Titanium dioxide pigmentation is invariable; silicate and carbonate extenders are usual; zinc compounds are rarely, if ever, used; inclusion of a fungicide is customary, but may need augmentation for extremely humid conditions.

Blister-resistant paints are usually self-priming; two coats on new wood is general practice, but three are preferred; coverage and drying time are normal. Dry, unweathered film has medium to low gloss and high opacity; weathered film is clean and of good color. Weathered coatings of blister resistant paints may be repainted directly, but blistered conventional paints should first be removed. Blister-resistant emulsion paints are unproved.

Coatings(organic), blisterproof, formulation

PDL-38994

Hesse, G. and E. Maroske
PVA LATEX PAINTS FOR EXTERNAL COATINGS. PARTS I AND II (in German)
Plaste u. Kautschuk 6:611-616 (December 1959); 7:44-46 (January 1960)

Coatings(organic), vinyl acetate, polymers, aqueous, fungi, toxics, review, foreign, pentachlorophenol, phenylmercury compounds

Jackson, Julius (to E. I. du Pont de Nemours and Co.)
COATING COMPOSITIONS CONTAINING A FERRIC POLYPHOSPHATE
Canada. Patent Office. Patent No. 591,709; February 2, 1960. 4 p.

Addition to organic film-forming vehicles of 2 to 50 (preferably 10 to 20) parts by wt of a ferric polyphosphate per 100 parts vehicle solids enhances light stability and outdoor durability without significant contribution to color or opacity. The off-white powder made by reacting ferric salts (preferably sulfate) with alkali polyphosphates is normally dispersed in the vehicle. Used alone or with other clear fillers, it enables a near-clear varnish comparable in outdoor durability with the best pigmented films. It may substantially replace more expensive pigments, and is particularly valuable for irridescent finishes.

Coating(organic), lightproofer, weatherproof, pigment, ferric polyphosphate, patent

PDL-40392

U.S. Forest Service. Forest Products Laboratory, Madison, Wisc.
FOREST PRODUCTS LABORATORY NATURAL FINISH
Report 2096 (rev.) May 1961) 4 p.

Coatings(organic), wood exterior, formulation, application

PDL-40374

American Society for Testing Materials, Philadelphia, Pa.
REPORT OF COMMITTEE D-1 ON PAINT, VARNISH, LACQUER, AND RELATED PRODUCTS
1961 Preprint 34. 71 p.

Coatings(organic), vehicles, pigments, tests, standards, specification

1961 Lac 69
Vol.18 PDL-38514

Schoen, Helmuth O., and Benson G. Brand (Battelle Memorial Institute, Columbus, Ohio)
MOLYBDATE PIGMENTS: NEW CORROSION INHIBITORS
Official Digest 32:1522-1543 (November 1960)

An exposure test study is reported of the corrosion inhibiting qualities of several calcium and zinc molybdates as steel primer pigments compounded with various conventional vehicles, with and without extenders, alone and with topcoats. Scribed and unscribed, painted steel panels were exposed to accelerated weathering up to 2500 hr, and outdoors at Daytona Beach, Fla. and in rural Ohio near Columbus for periods up to 28 mo.

Resultant data are presented and discussed. The molybdates generally equalled, and in some cases performed the red lead controls, even though used in formulations designed for the latter. Florida excepted, the materials performed overall in the order: calcium molybdate, normal zinc molybdate, zinc polymolybdate. Under topcoats, the order of success was: normal zinc molybdate, zinc polymolybdate, calcium molybdate. Most outstanding individually were several of the unextended zinc molybdate coatings; both after 1 yr in Ohio, and 2500 hr of accelerated weathering, scribe marks were still bright.

Fine-particle molybdates performed better than coarse. Linseed oil vehicles were superior to alkyd resin. Increasing the molybdenum-zinc ratio from 1 to 1.4 lowered corrosion resistance. Calcium and zinc molybdates are white, nontoxic, of lower specific gravity than the regular pigments, and neither soluble nor extremely insoluble in water.

Coating(organic), pigments, primers, steel, calcium molybdate, zinc molybdate, weathering

1961
Vol.18

Lac 70
PDL-39054

Graubart, Lawrence (Reichhold Chemicals, Inc., White Plains, N.Y.)

POLYESTERS AS CORROSION-RESISTANT COATINGS

SPE J. 16:1317-1323 (December 1960)

An experimental program is reported leading to development of a promising decorative and protective pigmented non-oil modified polyester for metals and masonry. The two-part material is chemical resistant, capable of multi-mil application, and air-cures at room temperature with little shrinkage.

To determine optimum surface preparation and priming, a polyester gloss coating(specified) was applied to steel and aluminum panels primed with 4 different primers, including an experimental polyester primer (unspecified). Weatherometer, salt-spray and impact-resistance testing pointed to an epoxy-polyamide-zinc chromate as the best primer, and to the value of sandblasting steel surfaces. Though lacking in resistance to reverse impact and alkalis, the polyester gloss gave adequate protection.

An improved polyester gloss and a flat type were then compared with 3 conventional compounds(epoxy-polyamide, long oil alkyd and melamine alkyd) as top-coats over sandblasted steel panels primed with an air-cured epoxy-versamid-zinc chromate, and over regular cinder-blocks. Ultraviolet and Weather-ometer exposure and chemical attack show less than average yellowing and loss of gloss by the polyester coatings, and generally good chemical resistance. They proved most resistant to hot detergent solution, to boiling, and to salt spray. The polyester coatings resisted direct impact satisfactorily but were susceptible to reverse impact. Comparative testing continues, with long-term outdoor exposures of panels and cinder-blocks at San Francisco and Miami.

Coatings(organic), polyester, steel, aluminum, chemical, weathering

1961
Vol.18

Lac 71
PDL-39046

Bosch, Wouter (Missouri. University)
MINIMUM PAINT FILM THICKNESS FOR ECONOMICAL PROTECTION OF HOT ROLLED STEEL AGAINST CORROSION
Official Digest 32:1602-1610 (December 1960)

A 3-yr interim report is presented on a long term study of three identical sets each of 644 test panels exposed at Fargo, N.D., Detroit, Mich., and Kure Beach, N.C. With five different surface preparations, specimens of four different forms of the same steel are coated with oil, alkyd, phenolic and vinyl commercial paints in six different primer-finish film thickness combinations. Also represented, but on a limited scale, are an epoxy ester and a chlorinated rubber type paint.

With only 48% of the Kure Beach panels at ASTM rusting stage 8, 15% at Fargo and 12% at Detroit, further exposure of at least 2-3 yr is necessary for conclusive results. Rated on the appearance of general rust only, the vinyls are performing best at all sites, followed by alkyds, oils and phenolics. Owing to their high zinc oxide content, the phenolics show early cracking and excessive early rusting. They may be excluded from the final assessment as not truly representative of phenolic paints. An additional set of flat panels coated with zinc-free phenolics has been placed on the Kure Beach site. Also, excessive chalking of vinyls at all sites has led to the addition at Kure Beach, of a limited set finished with a nonchalking vinyl.

Of panels painted with oils, alkyds or vinyls over sound mill scale or sandblasted white metal, not one has failed in the 1 mil primer plus 5 mil finish class. No results are given for epoxy ester and chlorinated rubber specimens. Phenolics excepted, as panels reach rusting stage 8 they are being repainted with 1-mil primer and 1-mil finish and re-exposed: one object of this study is determination of the economics of steel protection/retreatment.

Coatings(organic),steel, surfacement, oil base,alkyds, vinyl, polymers, phenolic, weathering

Deterioration
NRC

1961 Lac 72
Vol.18 PDL-39049

Gray, V. R. (Timber Development Assoc. Ltd., Research Laboratories, Penn, Eng.)
THE DURABILITY OF EXTERIOR CLEAR FINISHES FOR TIMBER
J. Oil & Colour Chemists' Assoc. 43:10-33 (January 1960)

The problems involved in providing a durable exterior clear coating for wood are reviewed and the various materials available are discussed. Results are given for outdoor rural weathering tests on 55 different finishes (specified) supplied by 31 manufacturers and applied in 1 to 5 coats on oak and western red cedar panels at 45° facing south in southern England. Under favorable conditions 9 of these finishes should last 2 yr with 3 coats. In this group are 4 phenolic-drying oil varnishes, 2 alkyd-drying oil varnishes, a modified drying oil and 2 polyurethanes. Histograms show progress of breakdown of each coat of each finish.

Coatings(organic), exterior, wood, nonpigmented

PDL-38512

Payne, Henry Fleming (Florida. University)
THE PHILOSOPHY OF COATINGS. A DISCUSSION OF BASIC PRINCIPLES, RECENT DEVELOPMENT, AND FUTURE POSSIBILITIES
Official Digest 32:1371-1434 (November 1960)

Despite recent major advances, even better paints are demanded for specialized applications. New binders such as the silicones and fluorocarbons have been produced, and under investigation are other polymers, including those containing phosphorous, boron, and sulfur; titanium and aluminum organics; wholly inorganic coatings.

The basic chemistry and physics of both conventional organic binders and newer types are discussed, and fundamental structures are related with performance in coatings. In particular, inherent potentials and limitations are emphasized.

Coatings(organic), review, theory, research program
Deterioration
NRC

1961
Vol.18

Lac 73
PDL-38659

Keane, John D., and Joseph Bigos
PAINTING OF WELDS
Corrosion 16:93-99 (December 1960)

Over 1100 welded, treated and painted test specimens were exposed up to 30 mo to an industrial atmosphere to determine methods of obtaining improved paint performance over the weld areas of steel structures. For best results, residues caused by the electrode coating should be removed; sand blasting is most successful, followed in order by pickling, power wire brushing and flame cleaning. If this type of cleaning is not possible, brush scrubbing with water or dilute chromic or phosphoric acid followed by a rinse is effective in improving paint performance. Certain anti-splatter compounds used in welding facilitate cleaning of welds and enhance paint performance; others are detrimental to the paint.

Over the test period no significant difference in the performance of our types of linseed oil and alkyd paints was found. Limited results indicate a significant advantage in use of a good vinyl, zinc dust, zinc rich or chlorinated rubber primer. Brush or spray application was equally good. In two coat systems, the initial performance of the primer is an index to subsequent performance of the system. Certain types of welding electrodes made painting more difficult; however, neither weld sharpness nor metallurgical factors such as stress corrosion or grain size were controlling factors. A minimum of alkaline deposit on the welds facilitates painting.

Welds, steel, coatings(organic), surfacements

Deterioration
NRC

1961
Vol.18

Lac 74
PDL-40347

Greathouse, Glenn A. (to the U.S. Secretary of the Navy)
ANTIFOULING COATINGS
U. S. Pat. 2,978,338; April 4, 1961. 2 p.

Nitrocellulose lacquer coatings containing 2 to 10% by wt of one or more of certain organic antienzyme agents prevent firm attachment of marine growth for up to 1 yr in Florida waters. A typical (acritical) lacquer vehicle comprises 4 gal amyl acetate, 4 gal benzine, 2 gal methyl alcohol, 2.5 lb pyroxyline. Suitable antienzyme components include octochloro-4, 7-methanotetrahydroindane alone at 2 to 6% by wt, or combined at 1 to 4% with similar amounts of N-trichloromethylthiotetrahydrophthalimide, the hydantoin analog thereof, or dichlorodiphenyltrichloroethane. The treatment is particularly suited to aluminum alloy substrates. Organisms are not killed but their enzyme systems are made incapable of producing materials required for attachment.

Coatings(organic), foulers, toxics, enzyme

PDL-39757

Birnbaum, L. A., and E. A. Morgenstern
TANK COATINGS
BuShips J. 10:2-3, 33-35 (April 1961)

Coatings(organic), tanks, ships, gasoline, sea water, fuel, epoxy, coal tar, urethan, coating(metallic), zinc, vinylidene, polymers

1961 Met 211
Vol.18 PDL-39311

Cohen, Raymond K. (Stanford Research Institute, Menlo Park, Calif.)
TIN PLATED CANS SPRAYED WITH SOLUBLE OIL FORMULATION SHOW INCREASED RUST RESISTANCE
Corrosion 17:75 (March 1961)

Development and prooftesting are reported of an emulsion containing 5-20% soluble oil in water, 0.5-2% sodium nitrite (inhibitor), and 0.25-5% Deriphat 151 as wetting agent and auxiliary inhibitor designed to reduce external sweat damage to canned goods in ocean transit and when exposed cold to a warm humid environment. Cans are sprayed just before labelling, at a material cost of less than 1¢ per case. The nontoxic coating does not complicate labelling, affect appearance of the tin plate, or present a fire hazard. In service trials, the treatment has proved effective against relatively light exposure. In the more severe conditions, however, it begins to break down and supplementary protection may be required.

Containers, tin, exterior, corrosionproofing, coating (organic)

PDL-40388

Wikle, K. G., and N. P. Sarle (American Society for Testing Materials, Philadelphia, Pa.)
PROPERTIES OF HARDENED COPPER-BERYLLIUM STRIP AFTER EXPOSURES TO ELEVATED TEMPERATURES
1961 Preprint 79. 20 p.

Copper alloy, alloying agent, beryllium, structures (metallographic), physical properties, temperature

PDL-40005

AS BRIGHT AS A NEW NAIL
New Scientist (London) 8:1509 (December 1960)

Iron, antique, corrosionproof, soil

Deterioration
NRC

1961 Met 212
Vol.18 PDL-40348

Hitzman, Donald O., and Ralph P. Schneider (to Phillips Petroleum Co.)
MICROBIOLOGICAL CORROSION PROTECTION BY GERMICIDAL ZONE AND PROTECTIVE COATING
U. S. Pat. 2,979,377; April 11, 1961. 3 p.

Buried and partially buried objects are protected against microbiological corrosion by: (1) applying a protective coating material containing 5 to 500 ppm (usually 50 to 100 ppm) of a suitable germicide to the object; and (2) treating the 1 to 6-in. thick contiguous layer of fill to a similar level with a different germicide-providing a double defence against environmental adjustment by bacteria.

The coating may be any of the regular commercial types, e.g., bitumen-impregnated wrapping or poly (vinyl chloride). A wide range of germicides are suitable, selection of type and level depending on such factors as nature of soil and microorganisms, and working characteristics of coatings. Fill additives are preferably water-insoluble. Typically, sulfate-reducing bacteria are combatted with arsenicals or chlorophenols; sulfur-oxidizing, nitrosifying, and nitrifying types, with phenolics or cresols. Other factors influencing selection include toxicity, ease of handling and cost. Objects which can be protected include pipes, pipelines, tanks and posts.

Metal, corrosionproofing, bacteria, soil, toxic, coatings(organic), tanks, pipe, posts, patent

PDL-40110

Zweben, Carl
EXPERIMENTAL REPAIR OF CORRODED STEEL SHEET PILE BULKHEADS
Engrs.' Digest (U. S. Coast Guard) No. 127: 7-10 (March/April 1961)

Steel, corrosion, pilings, repair, sea water

1961
Vol.18

Met 213
PDL-40242

Uhlig, Herbert H.

CRITICAL pH AND CRITICAL CURRENT DENSITY FOR PASSIVITY IN METALS

J. Electrochem Soc. 108:327-330 (April 1961)

Based on electrochemical mechanisms, an equation is derived for the relation of pH to the critical current density required to passivate metals: $\underline{i}(\text{crit.}) = \underline{K}(H^+)^{\lambda}$ where $\underline{K}$ and λ are constants. Accordingly, a linear relation between log $\underline{i}$(crit.) and pH is observed for chromium, nickel, and 14% chromium-iron alloys. When passivity occurs by reason of dissolved oxygen, it is shown that $\underline{i}$(crit.) usually equals the limiting diffusion current density for O_2. A critical pH exists above which passivity is stable, but not below. This critical pH decreases linearly with the logarithm of dissolved O_2 concentration. Calculated and observed values for the critical pH of 14% chromium-iron alloy are in reasonable agreement.

In absence of O_2, passivity is achieved when the rate of reduction of H^+ exceeds $\underline{i}$(crit.). Metals in this category must have Flade potentials more active than the hydrogen electrode in the same solution. More active Flade potentials accompany greater thermodynamic stability of the passive film, accounting in part for greater resistance to breakdown of passivity by specific anions. Among the metals in this category achieving high corrosion resistance in deaerated acids are titanium, tantalum, zirconium, and molybdenum.

Metals, passivity, pH, mechanism

1961 Met 214
Vol.18 PDL-39512

Losikov, B. V., and L. A. Aleksandrova
RUST INHIBITORS IN LUBRICATING OILS FOR MACHINES WITH INTERMITTENT OPERATION
Vestnik Mashinostroeniia 36:12-15 (May 1956)

The internal parts of intermittently operating machines, such as turbines and internal combustion motors, are exposed to the combined corrosive action of oxygen of the air and of water, always present in lubricating oils. This action is particularly strong after the machine is shut off, due to condensation of water during cooling. The only available means to protect such machines against corrosion is the addition of rust inhibitors to the lubricating oils. The following compounds were tested for anticorrosive action under laboratory conditions by the moist chamber method: naphthenic acids, abietic acid, stearic acid, aluminum, tin, lead, and zinc salts of naphthenic acids, aluminum, tin, and lead salts of abietic acid; unsaturated fatty acids and their esters; and unsaturated hydroxyacids and their esters. The inhibitors were added to turbine lubricating oil UT in amounts of 0.5 to 1%. Steel plates, covered with a film of inhibitor-containing oil were suspended vertically in the moist chamber at a relative humidity of 90 to 100%, and at temperatures varying from 40 to 70 C.

Steel samples, protected with oil containing unsaturated fatty acids and hydroxyacids or their esters showed no corrosion spots for 90 to 150 hr. The remaining inhibitors, with the exception of stearic acid, protected steel for periods not exceeding 15 to 20 min. Stearic acid protected the metal for about 1 hr. The protection period of oil without additives was 15 min. Horizontal metal surfaces were protected for considerably longer periods (e.g., 72 hr with stearic acid). The protection period of unsaturated acids and esters, however, was considerably shortened by the horizontal position of the samples. The unsaturated acids and their esters also were effective corrosion inhibitors for copper and its alloys. However, when copper or

copper alloys were continuously in contact with moist lubricating oil, the unsaturated acids reacted with the metal, forming more or less soluble copper salts which caused turbidity and discoloration of the oil. The esters did not react with copper.

Corrosionproofer, oils, lubricants, acids(organic), foreign

PDL-39340

Bedilo, A. T.
CORROSIVE STABILITY OF CONSTRUCTION ELEMENTS MADE OF ALUMINUM ALLOYS (in Russian)
Promyshlennoe Stroitel'stvo 37:52-53 (December 1959)

The high corrosion resistance of aluminum alloys, exposed to unfavorable weather conditions and to polluted atmosphere, is illustrated by four examples: the statue of Cupid in London; the window frames and doors of the Cambridge University Library building; the facade and window frames of the Daily Express building in London; and the roofs of the coal-gas purification plants near Liverpool. All these constructions, including the Liverpool plant roofs exposed to highly polluted atmospheres for 10 yr, show no trace of corrosion. The importance of aluminum alloys as the constructional materials of the future is pointed out.

Aluminum alloys, structures, weathering, corrosion, foreign

PDL-39052

Frank, Allen (U. S. Frankford Arsenal, Philadelphia, Pa.)
ACCELERATED CORROSION TESTING
Plating 47:623-631 (June 1960)

Tests, corrosion, salt spray, accelerated, review, bibliography

1961 Met 216
Vol.18 PDL-39339

Safonov, A. P.
THERMAL INSULATION AND THE EXTERNAL CORROSION OF UNDERGROUND HEAT LINES (in Russian)
Elek. Stantsii 30:24-28 (December 1959)

An inspection of underground heating piping in Moscow carried out in 1956-58 showed that in 20% of the pipes, 10 yr old or older, the insulation was deteriorating, and in 30% the surface of the metal was corroded. The main cause of deterioration of the thermal insulation materials was shown to be the alternate wetting and drying. Exposure to excessive moisture results in increased heat conductivity of the insulating materials and in considerable heat losses. It is also the main cause of corrosion of the pipes. At equal moisture contents, the rate of corrosion of the metal is determined by the nature of the insulation. Among the materials tested, asbestos-cement and diatomaceous earth insulations were highly corrosive and their use should be discontinued. Mineral wool, foamed concrete, and peat had low corrosivity. A lacquer coating was completely ineffective in protecting the metal against corrosion.

Metal, pipe, soil, corrosion, insulation, foreign

PDL-39863

Boggs, W. E., R. H. Kachik and G. E. Pellissier (United States Steel Corp. Applied Research Laboratory)
THE OXIDATION OF TIN. I. THE KINETICS OF OXIDATION OF PURE TIN AND THE EFFECTS OF TEMPERATURE AND OXYGEN PRESSURE
J. Electrochem. Soc., 108:6-12 (January 1961)

Tin, oxidation, mechanism

1961
Vol.18

Met 217
PDL-39810

Markovic, Tihomil
TECHNOLOGY OF CORROSION OF UNDERGROUND CONSTRUCTIONS (in Yugoslavian)
Nafta (Yugosalvia) 10:163-172 (May-June 1959)

A review of the physical structure of soil, its chemical and biological composition, and water-oxygen relation in "free" and water-logged soil is followed by a discussion of the mechanism of underground corrosion of iron. Considering the complexity of the soil structure and composition, the exact evaluation of the factors responsible for the corrosivity of soil is difficult. However, from experimental data and theoretical considerations, the electrochemical processes occurring on the surface of metal buried in the soil apparently are determined by the interaction of three main factors, viz., the water content of the soil, the degree of aeration, and the size of soil particles or aggregates. The rate of corrosion of iron depends on the degree of saturation of soil with water or, more correctly, on the water/oxygen ratio near the metal surface. There is no corrosion in completely dry soil. With increasing water content, the rate of corrosion increases and, at a certain critical water concentration, reaches its maximum, then decreases again at water concentrations approaching the saturation point. The mechanism of corrosion is related closely to the distribution of anodic and cathodic processes on the surface of the metal. At low soil moisture contents, the surface of the metal in contact with soil particles becomes the anode, while the free metal surface is the cathode. The size of soil particles determines the total anodic surface area of the metal. When the water content reaches the critical concentration, corrosion is controlled by the anodic process. When the soil is saturated with water, the surface of the metal in contact with soil particles becomes the cathode, and corrosion is controlled by the cathodic process.

Metals, corrosion, soil, mechanism

Deterioration
NRC

1961
Vol.18

Met 218
PDL-40001

Robertson, W. D., and A. S. Tetelman (Yale University. Hammond Metallurgical Laboratory)

A UNIFIED STRUCTURAL MECHANISM FOR INTERGRANULAR AND TRANSGRANULAR CORROSION CRACKING

Technical Report 2 (December 1960) 32 p.

A unified, structural mechanism is proposed to explain the phenomena of intergranular and transgranular stress corrosion cracking. Failure dependence on composition and stress in copper alloys and stainless steels is analyzed in terms of two general conditions: (1) a chemically reactive path, and (2) a mechanism of concentrating stress across the reactive path.

Intergranular fracture in a chemical environment is considered in terms of the normal stress distribution at the head of a group of dislocations piled up against a grain boundary. It is shown that available data are consistent with the proposed model with respect to (1) a grain size dependence; (2) stacking fault energy, which defines the number of coherent twin boundaries per grain and thereby the stress concentration at the boundary; and (3) the existence of an endurance stress, approximately equal to the macroscopic yield stress, below which the stress concentration at the boundary is insufficient to cause fracture.

The nucleating sites for transgranular fracture in single crystals, and in polycrystalline aggregates that fail transgranularly, are shown to be Cottrell-Lomer barriers. A detailed crystallographic mechanism of fracture is proposed which depends on orientation with respect to applied stress, and the strength of the barrier - which is related to the stacking fault energy. Available data are consistent with the model in predicting the composition dependence of transgranular fracture and, in favorable cases, the plane of fracture. The same mechanism is capable of explaining the dependence on composition and plastic strain of the transition from intergranular to transgranular fracture, which is demonstrated with copper alloys.

Metals, corrosion, stress, intergranular, mechanism

Deterioration

NRC

1961
Vol. 18

Met 219
PDL-39177

Zawadzki, Jerzy

EVALUATION OF PROTECTIVE PROPERTIES OF VAPOUR PHASE CORROSION INHIBITORS (in Polish with English summary)

Prace Inst. Mech. 8(28):1-13 (1960)

The effectiveness of various volatile inhibitors in preventing corrosion of steel was evaluated by several accelerated methods. Very good protection was afforded by papers impregnated with dicyclohexylamine nitrite. Spot-corrosion was observed on steel wrapped in papers impregnated with Leukorrosin (a German product of unknown composition). Because of its high volatility, cyclohexylamine carbonate afforded little protection when used in the form of impregnated paper. Tablets containing lactose, starch, talc, magnesium stearate and a binder, placed in waxed paper bags, were more effective. Both dicyclohexylamine nitrite and cyclohexylamine carbonate protected phosphated steel in a humid environment. Among the solutions tested, only dicyclohexylamine nitrite, cyclohexylamine carbonate, ammonium bicarbonate, and mixtures of cyclohexylamine phosphate with sodium carbonate or ammonium bicarbonate, and of cyclohexylamine benzoate with ammonium bicarbonate gave a significant reduction of the corrosion rate of steel. Cyclohexylamine carbonate had a detrimental effect on certain nonferrous alloys such as brass and bronze, and on anticorrosive paints. As shown in sea transport and tropical storage tests, cyclohexylamine carbonate is less effective than dicyclohexylamine nitrite in preventing corrosion of steel over long periods of time.

Vapor phase inhibitors, ferrous, nonferrous, packaging, foreign, comparison, dicyclohexylamine nitrite, cyclohexylamine carbonate

1961
Vol.18

Met 220
PDL-39341

Koshelev, G. G., and I. L. Rozenfel'd
CORROSION RESISTANCE OF LOW-CARBON AND LOW-ALLOY STEELS IN SEA WATER (in Russian)
Sudostroenie 25:12-17 (November 1959)

Steel sheet specimens (260 x 180 x 3 mm), rolled and normalized without removal of the oxide, or normalized with subsequent removal of the oxide, were mounted in steel frames, the frames placed between porcelain insulating plates to protect them from mechanical damage, and immersed in the sea at depths of 30 and 85 cm for periods up to 6 yr. Corrosion of the samples was evaluated visually and by weight loss after removal of corrosion products by cathodic polarization in 20% sodium hydroxide at a current density of 3-5 amp/sq dm.

Visual examination showed that the low-alloyed steels MS-1 and SKhL-1 corroded in a nonuniform manner, and showed more localized damage than the carbon steel ST-3 and the low-alloyed steel MK. The average corrosion rate was about the same for all steels from which the oxide layer was not removed. During 6 yr, the average weight loss was 2.5 to 3 kg/sq m, or 0.5 kg/sq m per yr. The depth of corrosion averaged 0.2 mm/yr for SKhL-1 and MS-1 steels, 0.12 mm/yr for MK steel, and 0.008 mm/yr for the carbon steel ST-3. Removal of the oxide layer after heat treatment reduced the corrosion rate of all steels by approximately 10%, and decreased the tendency of the low-alloyed steels toward localized corrosion. After 5 yr immersion in sea water the tensile and yield strengths of the steels decreased 20 to 37%, the reduction being greatest for steel SKhl-1, which also had the highest tendency toward nonuniform corrosion. The rate of mechanical strength loss was high during the first 2 yr, then levelled off. Removal of the oxide layer somewhat reduced the overall loss of mechanical strength, and resulted in a more uniform rate of loss during the 5 yr period.

Steel, surfacement, formulation, corrosion, sea water

1961
Vol.18

Met 221
PDL-40218

California Institute of Technology, Pasadena. Engineering Division (Milton S. Plesset)
ON CATHODIC PROTECTION IN CAVITATION DAMAGE
Report 85-12 ASTIA Doc. 226971 (July 1959) 18 p.

An experimental procedure was developed which permits accurate and reproducible determinations of cavitation damage. The procedure was applied to a study of the effect of cathodic currents on cavitation damage. A series of experiments, in which the test liquid was a 3% salt solution, showed a reduction in cavitation weight loss for all of the metals examined when the test specimen was made the cathode of an electrolytic cell and when the conditions were such that gas was evolved at the specimen surface. This protective effect against cavitation damage increased with increasing magnitude of the cathodic current. These observations support the view that the protective effect was due to the cushioning action of a layer of hydrogen gas evolved on the surface of the specimen. A similar protective effect was observed when the specimen was made the anode in distilled water buffered to pH 8; here the gas evolved at the specimen surface is oxygen. Additional evidence for this protective mechanism of a gas layer on the specimen surface was found in a series of experiments in which the voltage applied to the cell was reduced to a level at which no gas was evolved on the surface. There was then no protective effect with the specimen cathodic or anodic.

Metals, cavitation, cathodic protection

PDL-39865

Boggs, William E. (United States Steel Corp. Applied Research Laboratory)
THE OXIDATION OF TIN. III. THE MECHANISMS OF OXIDATION OF PURE TIN AND THEIR DEPENDENCE ON TIME AND OXYGEN PRESSURE
J. Electrochem. Soc. 108:124-129 (February 1961)

Tin, oxidation, mechanism

Deterioration
NRC

1961 Met 222
Vol.18 PDL-39169

Kurski, Kazimierż
THE CORROSION RESISTANCE OF ZINC-COATING (in Polish)
Wiadomości Hutnicze 16:191-196 (June 1960)

Numerical data are given on the corrosion rate of zinc coatings on steel in various media. The corrosion rate is determined essentially by the solubility of the corrosion products (zinc oxide, hydroxide, carbonate, and basic carbonate) in the various media, and by subsequent attack of the medium on the exposed surface of the base metal.

The durability of zinc coatings in a rural atmosphere containing little carbon dioxide is about 80 yr, in an urban atmosphere about 20 yr, in industrial zones about 5 yr, and in an atmosphere of high moisture and carbon dioxide contents (e.g., railway tunnels) only 1.5 yr. The pH of the medium is an important factor. In acidic media the corrosion rate is high, whereas in weakly alkaline media it does not exceed 1 mg/sq dm/day. The corrosion rate also is increased by high humidity and lack of aeration, for example during railroad transport of zinc-coated products. The presence in zinc of impurities, such as iron, cadmium, antimony, copper, has little effect on its atmospheric corrosion, but can become an important factor accelerating corrosion in liquid media. For example, the corrosion rate of pure zinc in water is 0.66 mg/sq dm/day, and that of zinc containing 0.25% antimony is 2.03 mg/sq dm/day. The corrosion rate of zinc coatings in distilled water is considerably higher than in hard water, particularly at higher temperatures. In sea water, the corrosion rate decreases with time, due to the formation of a protective layer containing magnesium salts. Zinc coatings are particularly resistant to corrosion by gaseous hydrogen sulfide, even at high temperatures. They are also quite resistant to corrosion when in contact with construction materials, such as asbestos and portland cements, bricks, clay, and sand. In contrast to tin and nickel coatings, zinc coatings prevent the corrosion of steel (by the mechanism of anodic protection) even when their continuity is broken by physical or chemical factors.

Coatings(metallic), zinc, corrosion, weathering, aqueous, foreign Deterioration
NRC

1961 Met 223
Vol.18 PDL-40060

Allied Research Products, Inc., Baltimore, Md.
METHOD AND COMPOSITION FOR PROVIDING A CORROSION-RESISTANT COATING ON ALUMINUM AND ALLOYS THEREOF
Gt. Brit. Pat. Spec. 837,971; June 15, 1960 4 p.

Aluminum and aluminum alloys are given a corrosion resistant coating, suitable as a paint base, by brush, spray or dip treatment with a composition comprising a hexavalent chromium compound, at least one cyanide from the group ferricyanic acid, ferrocyanic acid and their salts, and fluorine and barium in one or more compounds. The composition is applied in aqueous acidic solution (pH 0.1 to 3.0), at 0 to 71 C (preferably 18 to 27 C) for 0.5 to 6 min. It may be marketed in the form of a dry powder mix, a solution prepared for use or a concentrate for dilution. Coloring of the coating can be carried out in situ, varying the pH or contact time and by incorporation of additives, e.g., ferric chloride to give a blue coating. A typical composition comprises, in grams/liter, chromic acid 5, potassium ferricyanide 1, barium nitrate 1.9, and sodium fluosilicate 1.35.

Aluminum, aluminum alloys, coatings(organic), primer

PDL-39864

Boggs, W. E., P. S. Trozze, and G. E. Pellissier (United States Steel Corp. Applied Research Laboratory)
THE OXIDATION OF TIN. II. THE MORPHOLOGY AND MODE OF GROWTH OF OXIDE FILMS ON PURE TIN
J. Electrochem. Soc. 108:13-24. January 1961.

Tin, oxidation, mechanism

1961 Met 224
Vol.18 PDL-40221

Parker, A. K. (Zinc Development Assoc. Oxford, Eng.)
ZINC COATINGS ON IRON AND STEEL. PART 3. CORROSION RESISTANCE OF ZINC COATINGS
Metal Finishing J. (London) 5:445-453 (December 1959)

Coatings(metallic), zinc, corrosion, contaminants, sulfur, atmosphere, water systems, soil, sea water, review

PDL-40389

American Society for Testing Materials. Philadelphia, Pa.
REPORT OF COMMITTEE A-5 ON CORROSION OF IRON AND STEEL
1961 Preprint 4 36 p.

Aluminum, zinc, corrosion, coatings(metallic), wire, hardware, tests, atmosphere, standards, specifications

PDL-39893

Gatzek, Leo E. (Aerospace Corp.)
CORROSION PROBLEMS ENCOUNTERED IN SILO STORAGE OF MISSILES
Institute of the Aerospace Sciences, New York, N.Y. IAS Paper 61-12.

Corrosion, missile, storage, review

PDL-40404

Battelle Memorial Institute, Columbus, Ohio. Defense Metals Information Center (J. A. Gurklis and L. D. McGraw)
PICKLING AND DESCALING OF HIGH-STRENGTH, HIGH-TEMPERATURE METALS AND ALLOYS
Memorandum 85; PB 161235 (February 1961) 16 p.

Beryllium, titanium, molybdenum, niobium, tungsten, vanadium, tantalum, surfacement, process, steel, stainless, nickel alloy

1961 Met 225
Vol.18 PDL-39343

Kagan, D. IA., and T. A. Kaganer
INVESTIGATING NEW METHODS OF ANTICORROSION PROTECTION FOR STANDBY EQUIPMENT (in Russian)
Teploenergetika 7:55-58 (January 1960)

Samples of carbon steel 20, used most commonly for boiler construction, were half or totally immersed for periods of up to 5 mo in ammonia and hydrazine solutions at room temperature, and in emulsions of filming amines (octadecylamine, dioctadecylamine, a mixture of technical amines from $C_{16}H_{33}NH_2$ to $C_{20}H_{41}NH_2$, and a mixture of 75% $C_{14}H_{29}NH_2$, 3% secondary amines, and 22% nitroparaffins), at temperatures from 20 to 80 C. The rate of corrosion of the metal samples was determined gravimetrically. Control samples were immersed in steam condensate, tap water, and water containing sodium chloride and sodium sulfate.

The corrosion rates of the control samples were 0.055 gm/sq m/hr in the condensate, 0.043 g/sq m/hr in tap water, and 0.046 gm/sq m/hr in the salt water at room temperature. The corrosion rates were considerably higher at 60 to 80 C. The addition to water of up to 200 mg/liter of a filming amine reduced the corrosion rate of immersed samples by 30 to 50% at all temperatures. The half-immersed samples showed an increased corrosion rate at the phase boundary in the presence or absence of filming amines. However, a reduction of corrosion rate was observed in samples immersed in an amine emulsion, and then exposed to humid atmosphere. Depending upon the time of immersion (15 to 60 min), the rate of corrosion was reduced 20 to 60%. Solutions of hydrazine containing 200 mg/liter protected immersed steel for 1000 hr, and solutions containing 1000 mg/liter for 2000 hr. Steel did not corrode for 1650 hr in condensate water or salt water containing 200 mg/liter ammonia, and for over 3000 hr in solutions containing 500 mg/liter or more. On the basis of these results, solutions of ammonia, containing at least 500 mg/liter, and solutions of hydrazine containing at least 200 to 300 mg/liter can be recommended as anticorrosive agents for high-pressure boilers and other bulky equip-

ment. To be effectively protected, the boilers must be filled with water, the water boiled to expel air, and a measured volume of ammonia or hydrazine solution added to give the required concentration.

Boilers, water, storage, corrosionproofers, amines, ammonia, hydrazine, foreign

PDL-39862

General Electric Co. Hanford Atomic Products Operation, Richland, Washington. (H. C. Bowen)
ALUMINUM ALLOY WORK AT HANFORD
HW-65077. (May 1960) 16 p.

Aluminum alloy, nickel, iron, corrosionproof, alloying agent, processing, temperature, water

PDL-40226

Safranek, William H., H. R. Miller and C. L. Faust (Battelle Memorial Institute)
THE CORROSION PROTECTIVE CHARACTERISTICS OF DECORATIVE CHROMIUM PLATE
Plating 47:513-519 (May 1960)

Chromium, electroplate, corrosionproof, crackproof, formulation, process

PDL-40012

Barnartt, S. and D. van Rooyen (Westinghouse Electric Corp., Research Laboratories)
ANODIC BEHAVIOR OF AUSTENITIC STAINLESS STEELS AND SUSCEPTIBILITY TO STRESS CORROSION CRACKING
J. Electrochem. Soc. 108:222-229 (March 1961)

Stainless, corrosion, stress, mechanism

1961 Met 227
Vol.18 PDL-39999

Wiester, Hans-Joachim, and Günther Pier (Mannesmann-Forschungsinstitut GmbH., Duisburg, Ger.)
INVESTIGATIONS OF THE INTERCRYSTALLINE CORROSION OF AUSTENITIC CHROMIUM-NICKEL STEELS AFTER PROLONGED STRESSING BETWEEN 450° AND 800° (in German)
Arch. Eisenhüttenw. 30:293-297 (May 1959)

Stainless, stress, intergranular, corrosion, temperature, mechanism, foreign

PDL-40225

Uhlig, Herbert H., and Jerome P. Sava(Massachusetts Institute of Technology, Cambridge)
EFFECT OF NITROGEN, CARBON, AND SILICON ON STRESS CORROSION CRACKING OF 20% Cr, 20% Ni AUSTENITIC STAINLESS STEELS
(n.d.) 12 p.

Stainless, alloying agents, corrosion, stress, contaminants, mechanism

PDL-40227

Schafer, G. J. (New Zealand. Dept. of Scientific and Industrial Research)
A REFINEMENT IN THE ANALYSIS OF THE HYDROGEN EVOLUTION CURVES OBTAINED WHEN TESTING DURALUMIN FOR SUSCEPTIBILITY TO INTERCRYSTALLINE CORROSION
J. Applied Chem. (London) 10:138-139 (March 1960)

Aluminum alloy, stress, corrosion, mathematics, test

1961 Misc 89
Vol.18 PDL-39544

U.S. Office of Naval Research (Albert Collier and Frank Slowey)
SUBSURFACE ENVIRONMENTAL ELEMENTS AND THEIR POSSIBLE RELATIONSHIPS TO SURFACE "SLICKS"
Contract Nonr-2119(03), Interim Report; ASTIA Doc. 246612, 13 p.

The fatty acid contents of various dinoflagellates and ctenophores were determined by interesterification and subsequent gas chromatography. Tabulated are contents of C_6 to C_{24} acids of cultured and naturally occurring (Galveston Bay) species of Gymnodium and Mnemiopsis. Distinction is also made between saturated and unsaturated acids. Surface tensions over cultures of these organisms both living and crushed are compared with the effects of a number of fatty acids on the surface tensions of distilled water and of NH-15 culture medium.

The effects of mechanical and physical stimuli on plankton organisms and their role in the formation of surface slicks are discussed. Various speculative ideas are presented applying to a generalized theory of the relationships between the physical and biological elements of the marine environment as expressed in the phenomenon of surface slicks.

Marine organisms, analysis, fatty acids, surface effects, slime

PDL-39882

THE CHALLENGE OF THE MATERIALS AGE
Materials in Design Eng. 52(3):123-174 (September 1960)

Materials, research

1961 Misc 90
Vol.18 PDL-40058

British Petroleum Co., Ltd., London, Eng.
IMPROVEMENTS RELATING TO MOTOR FUELS
Gt. Brit. Pat. Spec. 833,628; April 27, 1960. 5 p.

Carburetor icing is inhibited by adding to gasoline 0.01 to 0.5% by vol. of a pentanediol in which the hydroxyl groups are attached to adjacent carbon atoms, and which has either a straight or branched chain. Suitable pentanediols are oxidation products of monoolefins (separated from diolefins) recovered from a cracked C_5 petroleum cut. A secondary additive may be 0.05 to 0.25% by vol. of a light lubricating oil with viscosity in the range 40 to 120 sec Redward 1 at 140 F.

Gasoline, iceproofer, patent

PDL-39651

Bailey, Donald L., and Ronald M. Pike (to Union Carbide Corp.)
ULTRAVIOLET LIGHT ABSORBING COMPOSITIONS
U. S. Pat. 2,950,986; August 30, 1960. 5 p.

Certain silicon-containing amine salts of benzophenone sulfonic acids (specified) can be used to produce ultraviolet light absorbent films which are not readily removed from glass surfaces. The absorbers also can be used in or on plastics and in suntan preparations. Glass is dipped 1 to 2 min in an aqueous or organic solution of the active compound at 25 to 100 C, dried, and baked 10 to 15 min at 150 to 250 C. Film thickness depends upon bath concentration of the U.V. light absorber; 0.5% by wt gives a film of about 4 μ whereas 2% by wt gives a 14 μ film. Films of about 20 μ absorb up to 98% of U.V. light up to a wavelength of about 3800 A. Plastics are treated either before or after fabrication at a temperature below the softening point.

Ultraviolet, lightproofers, glass, plastic

1961 Misc 91
Vol.18 PDL-39435

Mokhov, L. A., and V. P. Dzedzicheck
RAPID METHOD OF DETERMINING OZONE IN THE ATMOSPHERE (in Russian)
Zavodskaya Lab. 25:1304-1305 (1959)

The proposed method is based on the fading of the color of an indicator dye when in contact with ozone-containing air. The indicator composition is a mixture of 1 gm silica gel, 2 ml of a 0.01% solution of indigo carmine, and 1 ml of a 10% solution of magnesium sulfate ($MgSO_4.7H_2O$), dried to the point when it forms a powder. Magnesium sulfate in the mixture supplies moisture necessary for the oxidation of the dye by ozone. The powdered indicator is placed in one end of a small glass tube. On the other end, and separated from the indicator by a glass wool plug, the tube contains a small quantity of silica gel impregnated with a solution of chromic anhydride in sulfuric acid. This serves as an absorbing medium for any nitrogen oxides present in the air being analyzed. Both ends of the tube are stoppered with glass wool plugs. A definite volume of air is passed through the tube (1-3 liters for ozone concentrations of 0.0001-0.0007 mg/liter), and the color of the indicator is compared with a series of standards made by impregnating paper with solutions of indigo carmine.

Ozone, air, analysis, technique, foreign

PDL-40381

American Society for Testing Materials, Philadelphia, Pa.
REPORT OF COMMITTEE D-15 ON ENGINE ANTIFREEZES
1961 Preprint 47. 19 p.

Antifreeze, corrosion, ethylene glycol, methanol, formulation, tests, standards, coatings(organic)

1961
Vol.18

Misc 92
PDL-39291

Bollmann, W., and J. Spreadborough
ACTION OF GRAPHITE AS A LUBRICANT
Nature 186:29-30 (April 1960)

Electron microscopy of specimens, prepared either by rubbing a grid on a block of reactor grade graphite or by dusting peened or glass-rubbed powder on a grid, in every case showed a rolling up of sheets in regions thin enough to be observed by transmission. Sheets formed plain or spiralled rolls 0.1 to 1.0 μ in diameter and similar in structure to graphite whiskers. Sheet thickness in estimated at the order of 100 planes.

It is proposed that the lubricating properties of graphite are due essentially to a roller bearing mechanism. This would reconcile earlier observations of the effects of temperature, vacuum and vapor on the coefficient of friction. The influence at room temperature of water vapor, for example, may be understood as a loosening of interlayer binding forces, first at the edges of crystals and later inside them. At high temperatures in dry atmospheres, temperature-loosening might suffice. Although the sliding of graphite planes in small single cyrstals has been observed, it is difficult to imagine lubrication of graphite in terms of layers slipping over each other for large flakes and polycrystalline arrays. Such a mechanism would not be expected to show the observed sensitivity to the atmosphere, as dislocations usually tend to be locked by foreign atoms. The roller mechanism would not be expected to show the observed sensitivity to the atmosphere, as dislocations usually tend to be locked by foreign atoms. The roller mechanism would be expected to hold in other layer lattice crystals. Rollers also have been observed in molybdenum disulfide.

Graphite, lubricant, mechanism

1961 Misc 93
Vol.18 PDL-39292

Schiesser, Robert J. (Massachusetts Institute of Technology, Cambridge)
DESIGN FOR WHITE ROOMS
Air Eng. 2:42-45 (July 1960)

White room and enclosure considerations are reviewed, and enclosures specially designed for assembling inertial guidance systems are described. Since most foreign matter entering enclosures is airborne, extreme cleanliness of white rooms is essential. In the absence of standards governing particle size and incidence, it is hypothesized that any particle visible under a 40-x microscope is intolerable. AEC filters are used at present, but a newly developed type of stainless steel mesh promises superior performance. Degree of air purification is determined by many factors peculiar to a particular operation, notably by comparison of cost of more intensive filtration with cost of manual cleaning of components.

Sufficiently refined facilities are rarely available for fabricating nonstandard enclosures. Assemblers should design a model prototype and consult a commercial specialist on final design and production. General design considerations include human dimensions, work and storage space for component and equipment both inside and outside the enclosure, accessibility of work, comfort of operators, and microscope location and control. Material should be noncorroding and uncoated; stainless steel is excellent. Welds must be ground and polished, and corners coved to facilitate daily cleaning with solvent, vacuum hose, and nylon cloth or lens tissue. As far as possible utilities and outlets should be placed inside, and cords eliminated.

A particular enclosure described has its microscope mounted on the glass enclosure top, through which it is sighted. Input of 20 to 40 cfm maintains adequate air pressure within the 3 to 5-cu ft enclosure. Access by arm ports minimizes openings and protects the operator's chest from the constant air outflow. Internal airflow is directed round the peri-

phery., leaving the work area relatively clean and still. Airflow patterns are checked with dry ice and water. The enclosure is divided into two entirely separate sections, the rear section housing blower, filter, heater, and other utilities. Removable end plates enable amalgamation of two or more enclosures. Adaptability to various sizes of parts and assemblies is provided by a well housing a jack on which is mounted the work table in the form of an aluminum disc. The rotatable disc permits works to be placed under a static microscope.

Dust, contaminationproofing, air

PDL-40015

U.S. Quartermaster Corps. Quartermaster Research and Engineering Command, Natick, Mass.
THE APPLIED ENVIRONMENTAL RESEARCH PROGRAM OF THE DEPARTMENT OF THE ARMY
Reports Control Symbol CSCRD-23 Annual Report (June 1960) 41 p.

Progress report, environment, military, materiel, meterorology, research program

PDL-40376

American Society for Testing Materials, Philadelphia, Pa.
REPORT OF COMMITTEE D-2 ON PETROLEUM PRODUCTS AND LUBRICANTS
1961 Preprint 35 92 p.

Petroleum products, lubricants, gasoline, diesel, fuel, corrosion, tests, standards

1961 Misc 95
Vol.18 PDL-39504

Sykes, R. L., and D. A. Williams-Wynn (Union of South Africa. Leather Industries Research Institute, Grahamstown)

DEVELOPMENTS IN COMBINATION TANNAGES. PART II. SOME FACTORS WHICH INFLUENCE THE STORAGE STABILITY UNDER NORMAL CONDITIONS

J. Soc. Leather Trades' Chemists 45:16-26 (January 1961)

Deterioration of chrome leather retanned with various agents was studied under normal conditions (21 C and 65% RH).

Wattle extract, Quebracho and Sumas all caused considerable decrease in buckle tear strength within 9 mo. Retannage conditions and nature of chrome stock must be largely responsible. Increasing the level of retannage in general not only lowers initial strength but also hastens deterioration. Addition of masking agents limits the reaction between phenolic materials and solutions of chromium tanning salts; for any particular masking agent there is an optimum dosage giving the best balance between initial strength and stability. Masking agent levels giving maximum initial strength do not necessarily confer greatest resistance to subsequent degradation on prolonged storage.

Blending synthetic tannins with vegetable extracts improves initial strength, which is pH dependent; at a given pH, storage stability is improved. Although they were all prescribed for retanning, the syntans tested differed markedly. It is suggested that deterioration in storage is caused by liberation of strong acid from the chromium pelt complex as vegetable tannins enter the complex and displace sulfate.

Leather, storage, tanning

1961 Misc 96
Vol.18 PDL-39546

Corney, G. M. (Eastman Kodak Co., Rochester, N.Y.)
THE EFFECT OF GAMMA-RAY EXPOSURE ON CAMERA FILMS
Photo. Sci. Eng. 4:291-296 (September-October 1960)

Experimental subjection of conventional films to penetrating radiation of various intensities and for various periods before and after normal photographic exposure, and followed by conventional development, revelaed a reduction of effective contrast (by a general fogging) and speed, and increase in grain size. These effects depended only on the total amount of radiation, i.e., the product of intensity and exposure time. Extremes excepted, reductions in speed and contrast can be met satisfactorily by longer exposure and a higher-contrast grade of printing paper, respectively. Whether or not the increased graininess is tolerable depends on the degree of resolution required.

Gamma-ray sensitivity of a film cannot be predicted from its light speed alone. A method is described whereby sensitivity can be reasonably estimated on the basis of the film's characteristic curve to light, and knowledge of the density produced by the gamma-ray exposure in question. Film for use in fields of radiation should be as slow a speed as lens and exposure time will allow. It should have high contrast, a high ratio of light sensitivity to gamma-ray sensitivity and a long density scale of useful gradient.

Photographic, film, high energy

PDL-40207

Gerwitz, David L., T. W. Sudia, and Richard D. Durbin
(Minnesota. University. Dept. of Plant Pathology and Botany)
A CONTROLLED-TEMPERATURE CHAMBER
Phytopathology 49:832 (1959)

Equipment, microorganism, culture, temperature

Deterioration
NRC

1961 . Misc 97
Vol.18 PDL-40211

McConnaughey, William E. (U. S. Bureau of Ships)
ATMOSPHERE CONTROL ON SUBMARINES
BuShips J. 9:11-14. (May 1960)

Submarine, atmosphere, contaminationproofing

PDL-400104

U.S. Naval Research Laboratory (H. W. Yates and J. H. Taylor)
INFRARED TRANSMISSION OF THE ATMOSPHERE
Report 5453 (June 1960) 46 p.

Atmosphere, infrared, absorption, measurement, technique

PDL-37989

Kuncewicz, Leszek, and Zdzislaw Krzyzewski
AN EXAMPLE FOR THE DETERMINATION OF PARTICLE CHARACTERISTICS OF DUST USING THE PIPETTE METHOD (in German with English summary)
Staub 20:47-48 (February 1960)

Dust, dimensions, measurement, technique, foreign

PDL-39843

Taft (Robert A.) Sanitary Engineering Center, Cincinnati
PUBLICATIONS OF THE ROBERT A. TAFT SANITARY ENGINEERING CENTER. SECTION I. AIR POLLUTION
Technical Report A61-1 (January 1961) 28 p.

Atmosphere, contaminants, contaminationproofing, bibliography

1961 Misc 98
Vol.18 PDL-39892

Manelis, G. B. and F. I. Dobovitskiy
THERMAL DECOMPOSITION OF EXPLOSIVES BELOW THE MELTING POINT
U. S. Joint Publications Research Service JPRS:2487 (April 1960) 6 p.

Temperature, decomposition, explosives, rate, mathematics, mechanism

PDL-40418

CHART OF HARDNESS AND pH VALUES OF WATER IN THE U.S.
Soap Chem. Specialties, Blue Book, 1961. 236 p.

Water, pH, hardness, map, U.S.A.

PDL-39646

Lamb, Charles W. (Oklahoma University)
WATER CONDITIONING FOR RECIRCULATING COOLING TOWER SYSTEMS
ASTIA Doc. 241350. (1960) 130 p.

Water systems, corrosion, corrosionproofer, cooling towers, steel, microorganism, contaminants, water treatment

PDL-40387

American Society for Testing Materials, Philadelphia, Pa.
REPORT OF ALCA-ASTM JOINT COMMITTEE ON LEATHER
1961 Preprint 70. 7 p.

Leather, cracking, test, standard

MISCELLANEOUS

1961
Vol.18

Misc 99
PDL-38622

Jeney, Endre, and Sándor Szendrey
EXAMINATION OF METALLIC DUST PARTICLES IN THE ATMOSPHERE BY PAPER CHROMATOGRAPHY (in Hungarian)
Egészsegtudomány 3(1):59-65 (1959)

Dust, metal, contaminants, atmosphere, measurement, foreign

Deterioration
NRC

1961 Plas 115
Vol.18 PDL-39380

du Pont de Nemours (E.I.) and Co., Inc., Wilmington, Del.
COMPOSITIONS COMPRISING MODIFIED POLYMERS OF ETHYLENE
Gt. Brit. Pat. Spec. 834,291; May 4, 1960. 6 p.

Improved protection of ethylene polymers against weathering is provided by adding 0.02 to 5.0% by wt of one of the following polymers (where R_1 and R_2 represent identical or different alkylene groups containing 1-4 carbon atoms):(1) a polyalkoxy alkyl sulfide containing at least five reoccurring groups of the formula ($-R_1OR_1S-$); (2) a polyalkoxy alkoxyalkyl sulfide containing at least five reoccurring groups ($-R-OR_2OR_1S-1$): (3) a polyhydroxylalkyl sulfide containing at least five reoccurring groups ($-R_1(OH)S-$). When these are used, together with a pigment such as cadmium red or a dyestuff such as Monastral blue, the stabilizing effect is synergistic. Preferred compositions contain 0.25 to 1.0% of a polymer comprising reoccurring mercaptoethyl hydroxyethyl formal, thiodiethanol and thiodiethylene glycol ether, or 1-mercapto-2,3-propanediol groups.

Polyethylene, weatherproofer, patent, sulfur compounds (organic)

PDL-40412

Crawford, G. H., and D. E. Rice (Minnesota Mining and Manufacturing Co.) and J. C. Montermoso (U. S. Quartermaster Corps. Natick, Mass.)
NITROSO-FLUOROCARBON ELASTOMERS
Proceedings Sixth Joint Army, Navy, Air Force Conference On Elastomer Research and Development. Vol.2, P.643-671 (October 1960)

Elastomers, fluorocarbons, synthesis, chemicalproof, temperatureproof, nitroso compounds

1961 Plas 116
Vol.18 PDL-39383

Telegraph Construction & Maintenance Co., Ltd., London
(Edward Ingram Cooke)
IMPROVEMENTS IN AND RELATING TO THERMOPLASTIC MATERIALS
Gt. Brit. Pat. Spec. 832,065; April 6, 1960. 3 p.

Pentachlorophenol (penta) protection of thermoplastics against ants, termites and other insects is improved by replacing the hydrogen atom of the hydroxyl group with the residue of a fatty acid containing preferably no more than 20 carbon atoms per molecule. Suitable acids include butyric, capric, myristic, palmitic, stearic, 2-ethyl-hexanoic, lauric, and oleic. The modified penta is more compatible and without tendency to bloom, nontoxic to humans, and substantially insoluble in water. Degree of compatibility varies: e.g., polyethylene tolerates no more than 2% by wt of the laurate; poly(vinyl chloride), 10% or more. The ester may be premixed with the plastic, added during processing, or applied as a surface coating in a lacquer vehicle.

Polymers, polyethylene, poly(vinyl chloride), insect, toxics, pentachlorophenol, esters, patent

PDL-40411

Montermoso, J. C., C. B. Griffis and Angus Wilson
(U.S. Quartermaster Corps. Natick, Mass.)
PROPERTIES OF VULCANIZED NITROSO RUBBER
Proceedings Sixth Joint Army, Navy Air Force Conference on Elastomer Research and Development Vol 2, p.672-677.

Elastomers, fluorocarbons, nitroso compounds, vulcanizate, physical properties, chemical properties, processing

1961 Plas 117
Vol.18 PDL-40300

U.S. Forest Service. Forest Products Laboratory, Madison, Wis. (Kenneth E. Kimball)
EFFECTS OF AGING ON THE COMPRESSIVE PROPERTIES OF GLASS-FABRIC-BASE POLYESTER LAMINATES (NINE YEARS IN A NORMAL ATMOSPHERE)
Report 1882 (May 1961) 4 p.

Sections of reinforced glass-fabric-base polyester laminates were stored in a normal atmosphere (73 F and 50% R H) for 9 yr. Original properties, fabrication methods and test procedures are described in F. P. L. Reports No. 1820-A and 1821-A. Compression tests were made parallel to the warp of the glass fabric.

The physical properties of the samples before and after storage were the same. Barcol hardness values for the aged specimens averaged the same or slightly less than those of the original specimens. This may be accounted for by a slight change in measuring technique. The compressive values showed only slight changes in modulus of elasticity and maximum strength. The proportional limit load values, however, were all considerably lower for the aged materials. In view of the slight differences among the modulus of elasticity values and those for strength, it is likely that the apparent reduction in proportional limit is not significant.

Laminates, polyester, glass, reinforcement, storage, mechanical properties

PDL-39885

U.S. Bureau of Yards and Docks
PLASTIC PIPE AND FITTINGS IN WATER PIPING SYSTEMS OUTSIDE OF BUILDINGS AT NAVAL SHORE ACTIVITIES: CRITERIA AND GUIDANCE ON USE OF
BUDOCKS Instruction 10430.2A (March 1961) 4 p.

Polymers, water, systems, pipes, specifications

Deterioration
NRC

1961
Vol.18

Plas 118
PDL-39499

Baum, B. (Union Carbide Plastics Co., New York, N.Y.)
POLYVINYL CHLORIDE DEGRADATION AND STABILIZATION
SPE Journal 17:71-76 (January 1961)

Free radical and ionic theories of degradation and stabilization are reviewed in parallel. Although oxidation undoubtedly occurs by a free radical mechanism beyond the scope of the ionic theory, the operation of alkaline PVC stabilizers by a free radical mechanism is difficult to imagine. The free radical theory does not seem to cover the role of stabilizers as hydrochloric acid acceptors; nor does it allow for the possibility of weak points in the molecule being responsible for initiation of acid evolution. Thus, both theories are required to explain all the phenomena of degradation and stabilization of PVC.

Poly(vinyl chloride), decomposition, heatproofing, lightproofing, mechanism, theory

PDL-40409

Anderson, H.H. (General Tire and Rubber Co.)
COMPOUNDING FOR PROTECTIVE MASKS
Proceedings Sixth Joint Army, Navy, Air Force Conference on Elastomer Research and Development Vol. 2 p.552-564 (October 1960)

Rubber, ozoneproofing, mechanical properties, masks, formulation

PDL-39794

HOW GOOD ARE ENVIRONMENTAL TESTS FOR ELASTOMERS
Materials in Design Eng. 53:124-127 (April 1961)

Elastomers, tests, review, temperature, weathering, aging, ozone, corona, oil, water

1961 Plas 119
Vol.18 PDL-38422

Bartenev, G. M., and L. S. Bryukhanova
INFLUENCE OF INTERACTION, CROSS-LINKING AND TEMPERATURE ON THE RUPTURE AND STRENGTH-TIME DEPENDENCE OF RUBBER-LIKE POLYMERS (in Russian)
Zhur. Tekh. Fiz. 28:287-295 (February 1958)

Previous work established that the elastic rupture of rubbers occurs in a slow stage and a rapid stage. In the slow stage, a "fibrous" mechanism is observed, characterized by a rough rupture surface. Under the influence of stretching forces which split the secondary valence bonds (van der Waals bonds), oriented strands are formed, then, one after the other, break according to the degree of stretch to which they are subjected. At a certain critical stress value, the rapid rupture stage sets in, with the formation of cracks and splitting of chemical bonds in a manner analogous to the rupture of hard solid bodies. This rapid stage is characterized by a smooth rupture surface. According to Zhurkov, for solid bodies and rubbers the relation between the rupture time τ, and the stretching force σ can be expressed by the equation $\tau = Ae^{-\alpha\sigma}$ (1), where A and α are constants depending on the nature of the material and the temperature. For elastomers, however, this relation is expressed better by the equation $\tau = \beta\sigma^{-b}$ (2).

In this work, the kinetics of rupture under static stretching stresses within the 20 to 140 C temperature range was studied for the following noncrystallizing elastomers: polybutadienes SKB and SKBM, butadiene-styrene polymers SKS-10 and SKS-30, and butadiene-nitrile polymers SKSN-18, SKN-26, and SKN-40. The log permanence (rupture time) vs stress relation was linear for all polymers, in agreement with equation (2). Depending on the magnitude of the stress and on the nature of the elastomer, the rupture time varied from a few seconds to 10-11 days. With increasing intermolecular forces of the polymer, higher permanence corresponded to the same stress. An analysis of the permanence-stress curves in semi-logarithmic coordinates

shows a gradual shift from the relation expressed by equation (2) toward that expressed by equation (1) with increasing intermolecular forces. The elastic strength of rubbers is affected by cross-linking (vulcanization). With increasing density of the cross-linking bonds, the rupture time increases, but the molecular orientation is reduced. At constant rupture time, the elastic strength as a function of cross-linking density shows a maximum. The relation between the log of rupture time and the reciprocal of temperature is linear. The relation between rupture time, strength, and temperature is express by the equation $\tau = c\sigma^{-b}e^{U/RT}$ (3), where the constants b and c depend on the nature of the polymer and the structure of the vulcanizate. The energy of activation U is 13,2000 cal/mole and is independent of the stress. Its low value indicates that the degradation of elastomers is determined primarily by the intermolecular bonds of the van der Waals type. Photographs of the rupture surfaces show clearly that the rupture of elastomers and of their vulcanizates occurs in two stages. The ratio of the rough ("fibrous" rupture) zone to the total rupture surface depends on the nature of the polymer and stress conditions. It increases with decreasing stress, decreasing number of cross-links, and decreasing polarity (intermolecular forces).

Elastomers, butadiene, degradation, cross-linkage, temperature, theory,foreign

PDL-38349

Grassie, N.
THE CHEMISTRY OF THE DETERIORATION OF SYNTHETIC POLYMERS
J. Oil & Colour Chemists' Assoc. 42:706-720 (October 1959)

Polymers, decomposition, temperature, light, oxygen, high energy, mechanism

1961
Vol.18

Plas 121
PDL-39805

Maoirova, E. A.

STABILIZATION OF SOME PROPERTIES OF PLASTICS (in Russian)

Zhur. Priklad. Khim. 33:1862-1867 (August 1960)

The criterion of the suitability of plastics for machine parts (such as metal-cutting machines) is the permanence of physical and mechanical properties. Results are reported from a series of tests performed to determine dimensional and weight changes of several plastic materials when exposed to lubricating and cooling media.

Samples of polyamides P-68, AK-7, and P-54, polycaprolactam, tire cord-grade Kapron, and Textolite PT, in the form of disks, 30 and 50 mm in diameter and 2.5 mm thick, were defatted, dried at 70 C, and their weight and dimensions recorded with an accuracy of 0.0001 gm and 2 to 10 μ, respectively. The disks were then immersed up to 100 days in distilled water at 20 and 50 C, mineral oil at 20 and 70 C, a 10% oil emulsion containing 0.02% free alkali, a cooling liquid containing 1% triethanolamine and 0.25% sodium nitrite, sulfofrezole, and kerosine. The temperature of the last four liquids was 18 to 25 C.

The greatest dimensional and weight changes were observed in water, oil emulsion, and the cooling liquid. Rate of changes in water at 50 C was higher than at 20 C, but the final deformation and swelling were the same. In mineral oil at 20 C there were only small dimensional changes and an insignificant increase in weight. At 70 C, shrinkage and loss of weight were observed. In sulfofrezole and in kerosine, the dimensional and weight changes were slightly greater than in mineral oil at 20 C. Polyamide P-68 showed the greatest dimensional and weight stability. Its maximum increase in diameter (in water) was 0.7%, maximum shrinkage (in mineral oil) 0.5%, maximum weight increase due to swelling, 3.8%. The maximum diameter increase of cord-grade kapron was 2.5%. All other plastics tested had lower dimensional and/or weight stability.

Polymers, polyamides, water, oil, dimensions, solubility, kerosine

Deterioration

NRC

1961
Vol.18

Plas 122
PDL-39957

Dunkel, Walter L., Robert F. Neu, and Richard R. Phelan (to Esso Research and Engineering Co.)
METHOD FOR IMPROVING THE OZONE RESISTANCE OF STEAM CURED BUTYL RUBBER
U. S. Pat. 2,974,113; March 7, 1961. 3 p.

Ozone resistance of butyl rubber products is greatly increased by pre-cure dipping in an agitated aqueous slurry consisting of 5 to 50% by wt of one or more accelerators, selected from the group, tetramethylthiuram disulfide, tellurium diethyldithiocarbamate, zinc dibenzyldithiocarbamate, and sulfur.

Extrusions or other forms from normal formulations are coated with the slurry by 0.1 to 10-min dipping and cured by any regular method. Steam curing at 100 to 400 F for 1 to 600 min is preferred. Curing under a layer of accelerators increases cross-linking of surface double bonds, and antiozonation is effected without tendency to stain. Particular applications cited are weather-seals, garden hoses, and cable insulation. The technique is applicable to all rubbers, but is less beneficial to high-unsaturation polymers having many reactive double bonds.

Elastomers, butyl, ozoneproof, process, patent

PDL-40215

California Institute of Technology, Pasadena. Jet Propulsion Laboratory (Thor L.Smith and Paul J. Stedry)
TIME AND TEMPERATURE DEPENDENCE OF THE ULTIMATE PROPERTIES OF AN SBR RUBBER AT CONSTANT ELONGATIONS
Technical Report 32-36 (September 1960) 12 p.

Elastomer, styrene, butadiene, polymer, mechanical properties, stress, temperature

1961 Plas 123
Vol.18 PDL-39748

U.S. Naval Research Laboratory, (Suzanne Stokes, and R. B. Fox)

PHOTODEGRADATION OF HIGH POLYMERS. PART II. VACUUM PHOTOLYSIS OF POLY-α-METHYLSTYRENE

Report 5591 (February 1961) 16 p.

Photodegradation of thin films of poly-α-methylstyrene by near ultraviolet light was studied in vacuum at 27 and 115 C. Photolytic changes were followed by determining monomer formation by ultraviolet spectroscopy, residue molecular weight from intrinsic viscosity, and volatile products by mass spectroscopy. Quantum yields for chain scission and monomer formation were calculated.

The results are explained as a random breaking of polymer chain bonds, accompanied by depolymerization of polymer radicals to give monomer. At 27 C, quantum yield for chain scission is about 1×10^{-3}; for monomer formation around 7×10^{-3}. These results appear reasonable since low quantum yields are generally obtained when aromatic compounds are photolyzed with near ultraviolet light. Corresponding values at 115 C are 2×10^{-2} and 0.5, respectively. Zip length at 27 C is about 7 monomer units produced per bond broken; at 115 C, zip length is about 25. Small quantities of hydrogen, carbon monoxide, carbon dioxide, and a number of hydrocarbons were liberated, with approximately 1:1 correlation between number of main chain scissions and carbon monoxide + carbon dioxide molecules evolved. Bond scission at weak links cannot be ruled out as an initiation step.

After long exposures, the amount of ultraviolet-absorbing products is appreciable. They act as internal filters causing the degradation rate to fall off with time of radiation. Rate, however, is related linearly with amount of radiant energy absorbed by the polymer. Comparison of photochemical with radio-chemical degradation at room temperature shows the latter about 13 times more efficient in the chain breaking process; 170 times, in the depolymerization process.

It is concluded that within the conditions of the

tests, ultraviolet absorption results in decrease in molecular weight of the polymer, and that most of the molecular weight change occurs in the primary act of absorption of light and the subsequent chain scission. Depolymerization reactions contribute little to the overall decrease in molecular weight of the polymer.

Styrene, polymers, vacuum, ultraviolet, decomposition

PDL-40455

Bauer, W.
TECHNICAL ASPECTS OF THE AGEING OF PLASTICS(in German with English translation)
Kunststoffe 51:133-134 (March 1961)

Polymers, aging, review

PDL-40453

Neiderstadt, Günter
THE SELECTION OF SAMPLES WHEN TESTING GLASS FIBRE REINFORCED PLASTICS (in German with English translation)
Kunststoffe 51:191-195 (April 1961)

Polymers, glass, fiber, reinforcement, mechanical properties, tests, foreign

PDL-40380

American Society for Testing Materials, Philadelphia, Pa.
REPORT OF COMMITTEE D-14 ON ADHESIVES
1961 Preprint 46 27 p.

Adhesives, wood, plywood, tapes, adhesion, tests, standards, fungi, specification, high energy

1961
Vol.18

Plas 125
PDL-40284

Buffalo. University. Buffalo, N.Y. (Howard T. Post, and Willis T. Schwartz, Jr.)
THE DEVELOPMENT OF CHEMICALLY RESISTANT RUBBERS FROM SEMI-ORGANICS FOR USE AT EXTREME LOW TEMPERATURES
Progress Report Contract DA-19-129-QM-1271. (August 1958-February 1961) n.d. 35 p.

Elastomers, polymers, siloxanes, titanium compound (organic), magnesium compound(organic), chemicalproof, temperatureproof, synthesis

PDL-39225

Stanford Research Institute (Jerry McKay and R. M. Silverstein)
DEVELOPMENT OF FIRE-RETARDANT ELASTOMERS
Project SU-1910,Summary Technical Report (October 1960) 8 p.

Elastomers, fireproof, fluorine compound(organic), s-triazine, synthesis, progress report

PDL-40010

Central Laboratory T.N.O., Delft, Neth. (H. J. Hueck)
THE BIOLOGICAL DETERIORATION OF PLASTICS
T.N.O. Nr.93 (October 1960) 4 p.

Polymers, plasticizers, fungi, bacteria, insect, rodents, degradation, review

PDL-36191

Hill, James T., and Fred Leonard (U. S. Walter Reed Army Medical Center)
NEW METHODS FOR DETERMINING DISCOLORATION OF ELASTOMERS
Rubber Age (N. Y.) 86:97-101 (October 1959)

Vinyl chloride, polymers, film, discoloration, measurement

1961 Plas 126
Vol.18 PDL-40223

U. S. Forest Service. Forest Products Laboratory, Madison, Wis.
LIST OF PUBLICATIONS ON STRUCTURAL SANDWICH, PLASTIC LAMINATES, AND WOOD-BASE AIRCRAFT COMPONENTS AVAILABLE FROM THE FOREST PRODUCTS LABORATORY, MADISON 5, WIS.
Report RPI-4 (November 1960) 14 p.

Laminates, sandwich, polymers, wood, aircraft, bibliography

PDL-39638

Florida, University. Dept. of Chemistry (Paul Tarrant, David E. O'Connor and Frank J. Pisacane)
THE SYNTHESIS OF UNSATURATED FLUOROCARBONS
U.S. Quartermaster Corps. Quarterly Report No. 38 (September 13-December 13, 1960) 7 p.

Fluorine compounds(organic), elastomers, oilproof, temperatureproof, synthesis, progress report

PDL-36748

England, W. D., J. A. Krimian and R. H. Henrich (U.S. Detroit Arsenal, Center Line, Michigan)
WEATHER AGING OF ELASTOMERS ON MILITARY VEHICLES
Rubber Chem. & Technol. 32:1143-1154 (October-November 1959)

Elastomers, vulcanizates, tires, ozoneproofer, coatings (organic), storage, Butyl, neoprene, styrene-butadiene, urethane

1961 Text 73
Vol.18 PDL-40447

Hueck, H. J., and J. La Brijn (Zentrallaboratorium T.N.O., Delft, Neth.)
PENTACHLOROPHENOL AND DODECYLPENTACHLOROPHENOL AS MILDEW PREVENTIVES FOR COTTON
Textil-Rundschau 15:467-472 (September 1960)

Heavy cotton fabrics were impregnated with sodium pentachlorophenoxide (PCP) or dodecylpentachlorphenol (LPCP), buried in the soil for 14 days, then leached. Concentrations of 0.5 to 2% of either fungicide resulted in satisfactory mildew resistance as determined by tear tests. The percentage of PCP and LPCP necessary for good mildew resistance cannot be determined exactly because of the sensitivity of mildew prevention in relation to factors such as fabric weight and removal of hemicellulose, pectins and waxlike substances in the process.

Water repellents, such as Mystolene W or Resistol, markedly improved mildew resistance of LPCP and increased resistance to leaching of both PCP and LPCP. At a 2% PCP concentration the water repellent is sufficient to prevent leaching; at a lower concentration of the preservative, fixation with a copper salt is required for good results. The water repellent alone is sufficient for LPCP. Boiling with sodium hydroxide prior to PCP and LPCP impregnation is necessary for even treatment.

Textiles, cotton, fungi, toxics, pentachlorophenol, laurylpentachlorophenol, water repellent

PDL-37747

Rochas, P., and J. C. Martin
STUDY OF THE THERMAL STABILITY OF POLYAMIDE 6.6 (NYLON) (in French with English summary)
Bull Inst. Textile France No. 83:41-84 (August 1959)

This study included determinations of the degree of yellowing, and some physical and chemical properties of nylon samples exposed to temperatures up to 150 C

in vacuo, in an atmosphere of pure dry nitrogen, pure dry oxygen, moist oxygen, and in normal atmosphere in the presence of oxidizing agents. A description and a diagram are given of the apparatus used. Some of the photochemical and chemical methods were modified to adapt them to the specific needs of this study.

Storage up to 29 mo in the dark at 20 C and 65% RH causes no discoloration or degradation of nylon. Heating at 100 C in vacuo, in dry nitrogen, or in light causes chemical degradation, but no yellowing. At 100 to 150 C a reduction of tensile strength and degree of polymerization occurs, involving rupture of amide bonds in the macromolecular chain, followed by partial decarboxylation. Yellowing is observed at 100 to 150 C in an atmosphere of dry oxygen, the degree of yellowing and degradation increasing with temperature. The rate of yellowing is high during the first 10 hr of heating, and considerably lower thereafter. The presence of moisture reduces the rate of yellowing in oxygen; the presence of oxidizing agents, such as hydrogen peroxide, sodium hypochlorite, or sodium chlorite, accelerates it. The behavior of heat-treated nylon toward acidic, basic, and polydisperse dyes indicates changes in the molecular structure of the polymer caused by heating.

The yellowing of Nylon is accompanied by (1) a reduction in the number of free amino groups without loss of total nitrogen content, (2) a shift of the fluorescence in ultraviolet light toward the yellow-orange range, and (3) a positive reaction with the Ehrlich reagent. The tendency toward yellowing is increased as a result of partial depolymerization by acid or photolysis. It is temporarily reduced by acetylation.

On the basis of these findings, the following mechanism of yellowing is proposed: Thermal oxidation of the polyamide results in cleavage of amide bonds, and in conversion of free amino groups into yellow-colored products, mainly of the pyrrole type. The fact that the polyamide (obtained by the condensation of adipic acid with m-xylenediamine)undergoes on heating a similar yellowing with the formation of pyrrole rings, indicates that in nylon the formation of pyrrole rings involves not only hexamethylenediamine, but also

the adipic acid residues. Most probably, the α-methylene group of the acid is oxidized to a keto group. The condensation of the enol form of the α,α'-diketoacid residues with free amino groups leads to the formation of pyrrole rings.

Nylon, textile, temperature, discoloration, mechanical properties, mechanism, decomposition, foreign

PDL-40057

Celanese Corp. of America, New York, N.Y.
REGENERATED CELLULOSE FILAMENTARY MATERIAL
Gt. Brit. Pat. Spec. 836,204; June 1, 1960. 2 p.

Strength loss by exposure to sunlight of high tenacity (7 to 8 gm/denier) regenerated cellulose filament, made by saponifying oriented wet-spun filament of a cellulose ester, is substantially reduced by treatment with resorcinol monobenzoate. The compound is especially effective when concentrated at or near the surface, and resists mild scouring. It causes no discoloration, and no stiffening or strength loss under prolonged exposure to high temperatures.

Resorcinol monobenzoate at 0.1 to 5% by wt is either added to the spinning solution or applied to the filament (preferably after saponification) from any liquid dispersion by spraying, wiping or dipping.

Rayon,textile,lightproofer,patent,
resorcinol benzoate PDL-39746

Daruwalla, E. H., and C. I. Peter (University. Bombay)
FLUORESCENT BRIGHTENING AGENTS: THEIR PHOTODECOMPOSITION IN AQUEOUS SOLUTION AND ON SUBSTRATE AND PHOTOTENDERING ACTIVITY FOR CELLULOSE
Textile Research J. 31:263-276 (March 1961)

Absorption characteristics and fluorescent decay of fluorescent brightening agents derived from 4,4'-diaminostilbene-2, 2'-disulfonic acid and of a thiazole derivative, when present in aqueous solution and on cellulosic substrate after exposure to sunlight and Fade-Ometer irradiations, were studied. Extent of photodecomposition depends on the amount of brightener

present in the substrate, its chemical constitution, the nature of radiation, and duration of exposure. With all brighteners studied, absorption in the 300 to 350-mμ range decreases appreciably after exposure, and products of decomposition in some cases are yellow to brown in color and do not fluoresce. Diaminostilbenedisulfonic acid excepted, a linear relation exists between reduction of absorption in the 300 to 350 mμ region and fluorescence intensity of a brightener after exposure.

Simultaneous with brightener photodecomposition during exposure, material bursting strength of the cotton substrate is diminshed, the cuprammonium fluidity increases, and the copper number rises considerably.

In general, fluorescence decay of the brightener on the substrate correlates with extent of tendering effected; compounds which decompose more readily also cause enhanced tendering. With all brighteners studied, even after exhaustion of the fluorescing capacity of the compound, degradation of fiber substance continues when the time of exposure is extended. This indicates that not only the compounds but also their photodecomposition products are effective in breakdown of cellulose chain molecules.

Cotton, brightening agents, fluorescence, light

PDL-40557

Rose, W. Gordon, Mayo K. Walden, and Joseph E. Moore
(U. S. Agricultural Research Service. Western Regional Research Laboratory, Albany, Calif.)
COMPARISON OF ULTRAVIOLET LIGHT ABSORBERS FOR PROTECTION OF WOOL AGAINST YELLOWING
Textile Research J. 31:495-503 (June 1961)

Substituted benzophenones are effective in protecting wool against yellowing by ultraviolet light. Protection is not simply dependent on absorption of ultraviolet light, since substances having similar absorption characteristics vary greatly in protective efficacy. Moreover, the degree of protection afforded by a given absorber may vary considerably with the method of its

application. Within the limits of this study, greatest protection is obtained from water-soluble absorbers, e.g., sulfonates, using dyebath techniques. Efficacy depends also on dyebath acidity. Almost complete protection against yellowing is effected by application of 2,4-dihydroxybenzophenone-2' -ammonium sulfonate from hot aqueous solution at pH 1.3 to 1.7. Evaluations were made by measuring the change in reflectance of treated and untreated wool cloth after irradiation with several light sources.

Wool, discolorationproofer, ultraviolet, benzophenones

1961 Wood 107
Vol.18 PDL-38190

Marian, J. E., and A. Wissing
THE CHEMICAL AND MECHANICAL DETERIORATION OF WOOD IN CONTACT WITH IRON. PART I. MECHANICAL DETERIORATION
Svensk Papperstidn. 63:47-57 (February 1960)

Experiments were carried out under conditions simulating certain environmental factors operative under natural service conditions (contact of wood with iron, presence of moisture and atmospheric oxygen, cycling.) Clear evidence was obtained that wood in contact with rusting iron for a sufficient length of time suffers considerable deterioration of tensile strength; compression strength is not affected.

Test pieces of Scots pine log were threaded alternately with thin steel plates on thick steel rods, and exposed up to 9 mo to a series of alternate 24-hr periods of tap water and drying at room temperatures. Rupture of these samples was compared to controls threaded on glass rods without the steel plates. The deteriorating effect of rusting increased with time, whereas the time of exposure had no influence on the controls.

Some rusted specimens and controls were deironed and delignified after 3 mo cycling. Tensile strength of the delignified test pieces, consisting of holocellulose containing small amounts of lignin, was not affected, while compression strength was reduced. This indicates that the deterioration of wood by rusting iron mainly affects the holocellulose (polysaccharide) fraction and very slightly, if at all, the lignin portion. It also establishes a definite relationship between chemical changes of constituents and mechanical properties, and is in agreement with currently accepted beliefs concerning the relative contribution of wood constituents, holocellulose and lignin to the tensile and compression strengths of wood.

Wood, iron, corrosion products, mechanical properties, decomposition

Deterioration
NRC

1961 Wood 108
Vol.18 PDL-38191

Marian, Joe E., and Arne Wissing
THE CHEMICAL AND MECHANICAL DETERIORATION OF WOOD IN CONTACT WITH IRON. PART 2. CHEMICAL DECOMPOSITION
Svensk Papperstidn. 63:98-106 (February 1960)

Chemical analyses of rusted and nonrusted wood including laboratory exposed material and 10 yr old crossties show that the changes induced through rusting iron, at least in the early stages, consist of a decomposition of hemicellulose into NaOH-soluble fission products. It is undertain whether or not longer exposure will result in a decomposition of the cellulose. However, it is evident that decomposition of the hemicellulose is greater than that of the cellulose. The results also show that chemical changes, either in the nucleus or in the side chains of the lignin cannot be appreciable. Chemical decomposition, therefore, involves mainly the polysaccharide portion of the wood.

Investigations carried out on the laboratory exposed material and material taken from crossties in service demonstrated identical chemical changes. This justifies the conclusion that laboratory exposure corresponds to service conditions, and that deterioration of mechanical strength properties found in the laboratory would also occur in service. Decomposition of polysaccharides in wood is explained as a metal-catalyzed autoxidative chain reaction.

Wood, iron, corrosion products, decomposition, mechanical properties

1961 Wood 109
Vol.18 PDL-38192

Marian, Joe. E., and Arne Wissing
THE CHEMICAL AND MECHANICAL DETERIORATION OF WOOD IN CONTACT WITH IRON. PART 3. EFFECT OF SOME WOOD PRESERVATIVES
Svensk Papperstidn. 63:130-132 (March 1960)

Three- and six-month exposure tests were run on Scots pine impregnated with creosote or zinc-chromium arsenate (Boliden Salt K33).

Creosote treatment, to some extent, prevents the deterioration of wood in contact with iron, especially that of sapwood. However, the presence of creosote seems to produce a slight decrease in tensile strength of wood exposed to alternate flooding and air drying. The presence of zinc-chromium arsenate appears to promote the decomposition of wood by rusting iron.

The chemical changes in wood in contact with iron, which lead to decreased tensile strength, can also be expected in preservative treated wood.

Wood, iron, corrosion products, toxics, decomposition, mechanical

PDL-40019

Browne, F. L. (U. S. Forest Service. Forest Products Laboratory, Madison, Wis.)
THE PRESERVATIVE TREATMENT AND STAINING OF SHINGLES
Report 761 (rev.) (October 1960) 7 p.

Roofing, wood, coating(organic), weatherproofing

PDL-40402

U.S. Forest Service. Forest Products Laboratory, Madison, Wis.
SPECIAL METHODS OF SEASONING WOOD. VAPOR DRYING
Report No. 1665-3 (rev.) 4 p.

Wood, seasoning, technique

1961 Wood 110
Vol.18 PDL-39501

Lee, C. L. (British Columbia. University, Vancouver)
CRYSTALLINITY OF WOOD CELLULOSE FIBERS STUDIED BY X-RAY METHODS
Forest Products J. 11:108-112 (February 1961)

X-ray spectrometry was used to study quantitatively: (1) variation in crystallinity with age of pulp from a young tree; (2) difference in degree of crystallinity between summerwood and springwood pulps; (3) crystallinity of reaction wood in comparison with that of normal wood; and (4) relationship between crystallinity and decay by brown rot fungi.

Resultant data show that crystallinity, of pulp and holocellulose of the normal western hemlock sampled, increased significantly through successive growth rings from the pith to about 15 yr, after which it became virtually constant; summerwood samples showed significantly higher crystallinity than springwood. Crystallinity of Douglas-fir compression-wood pulp and holocellulose was considerably lower than that of normal wood; of cottonwood tension wood samples, significantly higher. Factors other than abnormal chemical and physical properties of reaction wood must contribute to its characteristics.

Crystallinity of cottonwood and Douglas-fir holocellulose increases appreciably during decay by the brown rot fungi Poria incrassata and P. monticola; increase is rapid until 6% weight loss, whereafter the crystallinity value becomes constant. With compression wood, increase continues through the 15% weight loss stage, but at a slowing rate. The order of degree of crystallinity for various woods after decay is the same as for controls, tension wood showing the highest value and compression wood the lowest. The relative value of crystallinity after decay depends mainly on initial crystallinity rather than the history of decay.

Wood, crystallinity, measurement, fungi, wood-rot

1961 Wood 111
Vol.18 PDL-38972

Kauman, W. G. (Australia. Commonwealth Scientific and Industrial Research Organization. Division of Forest Products)

CONTRIBUTION TO THE THEORY OF CELL COLLAPSE IN WOOD: INVESTIGATIONS WITH EUCALYPTUS REGNANS

Australian J. Applied Sci. 11:122-145 (March 1960)

Total cell collapse is considered as the sum of "liquid tension collapse" and "stress collapse". An equation gives total collapse as a linear function of wood temperature and, to a smaller extent, of collapse-free shrinkage. The parameters of the equation depend only on surface tension data and on structural and rheological properties of wood. Total collapse is particularly sensitive to variations in the compressive stress perpendicular to the grain at the limit of plastic flow and in the effective radius of the largest opening in the wall of a collapse-susceptible cell. Even small variations in compressive strength and capillary radii may largely account for the marked variations in collapse from tree to tree and within trees.

To test the theory, Eucalyptus regnans cubes of 7/8 in. edge length were dried at temperatures ranging from 70 to 285 F, using two levels of humidity at each temperature. In addition, specimens measuring 7/8 x 7/8 X 3 in. were dried at 150 F and low humidity. The results show good agreement with theoretical values for wood temperatures up to about 190 F. For higher temperatures, or very low humidities, collapse is found to be significantly time-dependent.

Although the liquid-tension collapse theory considers phenomena in an idealized single cell, quantitative agreement with experimental results suggest that the basic operational unit in wood undergoing collapse behaves largely like a single cell, even though it may be composed of many cells. Collapse in small cubes is comparable to that observed in the thickness of specimens of rectangular cross section and, in the case of end-sealed cubes, to that in the thickness of long, 7/8 in. thick boards of rectangular

cross section. Rectangular specimens and boards, however, collapse to a smaller extent in width.

Wood, structure, failure, theory, eucalyptus

PDL-38194

PROCEEDINGS OF THE FIFTH ANNUAL MEETING OF THE COMMITTEE FOR THE PROTECTION OF TIMBER AGAINST MARINE ORGANISM ATTACK, HELD AT TRIVANDRUM ON 7TH AND 8TH IN THE KERALA UNIVERSITY BUILDING AND AT ERNAKULAM ON 9TH AND 10TH MARCH 1960 IN THE SACRED HEART'S COLLEGE, THEVARA
J. Timber Dryers' & Preservers' Assoc. of India. 6(2):1-22 (April 1960)

Annual report, India, wood, exotic, toxics, borers, foulers, bionomy, sea water

PDL-40391

Youngs, Robert L. (U. S. Forest Service. Forest Products Laboratory, Madison, Wis.)
RECENT PROGRESS TOWARD AN UNDERSTANDING OF THE PHYSICAL AND MECHANICAL PROPERTIES OF WOOD
Forest Products J. 11:214-225 (May 1961)

Wood, mechanical properties, physical properties, review

PDL-40017

U.S. Forest Service. Forest Products Laboratory, Madison, Wis.
LIST OF PUBLICATIONS ON PULP AND PAPER
Report 444 (August 1960) 58 p.

Paper, pulp, fiberboard, bibliography

1961 Wood 113
Vol.18 PDL-37654

U.S. Forest Service. Central States Forest Experiment Station, Columbus, Ohio (Thomas M. Headlee)

SHOULD I ROOF MY LUMBER?

Technical Paper 171 (April 1960) 5 p.

Degrade and rate of air-drying were measured in roofed and nonroofed piles of 4/4-in. yellow-poplar lumber. Six piles were studied during spring and six during summer. All lumber was dried for 45 days. Three grades were employed and stacked edge-to-edge in piles 6 ft wide, 12 ft long, 10 tiers high; one pile of each grade was roofed, one nonroofed. Low piles were used and moisture-sample boards were included to measure moisture loss.

Warpage caused serious losses in the upper tiers of nonroofed piles during both seasons. During the summer, bluestain was the major cause of degrade. It affected equal volumes of roofed and nonroofed lumber but was heavier in the nonroofed. Since lumber-grading rules will not permit as much stained area in the higher grades as in the lower, most degrade occurred in the nonroofed pile of Selects and Better. Although there was little difference in moisture content of roofed and nonroofed lumber after 45 days, roofed lumber dried at a more uniform rate and in spring reached the fiber saturation point 12 days sooner.

A sturdy rain-tight corrugated steel on wood frame roof can be built for $25 (January 1959), be used a minimum of 20 times, and can be placed and removed for $1.00. It pays for itself in three uses on Selects and Better yellow-poplar lumber and in 7 uses on No. 1 Common. Apparently, however, it does not pay to roof lower grades of lumber.

Lumber, storage, weathering, interior, cost

1961 Wood 114
Vol.18 PDL-37971

Lederer, S. J., and William J. Delaney (Metalsalts Corp., Hawthorne, N.J.)
DI(PHENYLMERCURIC)-AMMONIUM PROPIONATE--A NEW SLIME CONTROL AGENT
Tappi 43:160-166 (February 1960)

Several hundred new organo-mercurials were investigated as potential slimicides. Nonmercurials were included in the tests for comparison. The di(phenylmercury)ammonium complexes were highly effective; activity is attributed to the extreme stability of the complex. Whereas phenyl mercurials react with sulfur compounds to form an extremely stable mercury-sulfur linkage which partially deactivates the mercurial, the ammonium salt forms a much weaker nitrogen-sulfur bond which remains in active form. In contrast to phenyl mercurials, the ammonium complexes, in the presence of chloride ions, form the chloride which is 2000 times more soluble in water. With some salts solubility is increased 10,000 times.

Di(phenylmercury) ammonium propionate was evaluated at two mills; the first using bleached kraft hardwood pulp and the second, a mixture of groundwood and sulfite pulps. Preliminary results corroborate with laboratory data and indicate that di(phenylmercury) ammonium propionate is considerably more effective than several of the products which have, to date, been most successfully and widely used.

Slime, toxics, phenylmercury compounds, quaternary, mercury compounds(organic)

PDL-40405

U.S. Forest Service. Forest Products Laboratory, Madison, Wis. (J. M. McMillen)
SPECIAL METHODS OF SEASONING WOOD. HIGH-FREQUENCY DIELECTRIC HEATING
Report No. 1665-Z(rev.) (February 1961) 4 p.

Wood, seasoning, technique

1961 Wood 115
Vol.18 PDL-37840

U.S. Naval Civil Engineering Laboratory, Port Hueneme, Calif. (Harry Hochman and Thorndyke Roe, Jr.)
HARBOR SCREENING TESTS OF MARINE BORER INHIBITORS - II
Technical Report 077,...ASTIA Doc. 235875 (March 1960) 29 p.

Harbor tests were conducted at Port Hueneme, California, and Pearl Harbor, Hawaii on treatment of wood to reduce damage caused by marine borers to waterfront structures.

Panels treated with coal tar, creosote, 70-30 creosote tar solution, tributyltin oxide, and tributyltin coconut fatty acid salt were protected against Martesia and teredine attack but not against Limnoria. Copper compounds, chlordan, dieldrin, endrin, methoxychlor, phenylmercury compounds, and coal tar plus phenylmercury oleate gave resistance to Limnoria but not Martesia or teredine attack. Coal tar plus solubilized copper oxinate protected only against teredine borers. Panels treated with phenylmercury compounds in creosote-coal tar or in creosote, or with aluminum, copper, and manganese oxinates in creosote were attacked by Limnoria, but initial attack takes longer than with panels treated only with creosote or 70-30 creosote-coal tar solution. Inorganic mercury compounds resist Limnoria and Martesia but not teredine attack. Oxalic acid, oxine and two quaternary ammonium bases are effective against Martesia attack. Acenaphthene, carbazole, and phenanthrene are ineffective against Limnoria and teredine borers. Copper naphthenate is resistant to all types of attack. Of the untreated woods, greenheart and acetic acid, chloroform, ether, or methanol extracted greenheart have good resistance to borer attack. Greenheart extracted with sea water failed in 14 mo at Port Heuneme.

Combination treatment, containing a material specifically toxic to Limnoria and another which is toxic to teredine borers, shows promise as a method for the improvement of presently used preservatives, or the

development of new preservatives. Although the combination of two specifically toxic materials may produce a treatment which is superior to either material, it is also possible that the treatment will be inferior because of a physiological inhibitory effect of one material upon the other. The presence of two materials in one panel may create a system in which one may act as solubilizing agent and thus enhance the leaching of the other. Only harbor exposure tests can definitely establish the effectivness of any preservative system against marine boring organisms.

Wood, toxics, borers, Teredo, Limnoria

PDL-39307

Kathpalia, Y. P. (National Archives of India, New Delhi)
DETERIORATION AND CONSERVATION OF PAPER. PART I. BIOLOGICAL DETERIORATION
Indian Pulp & Paper 15(1):117-118, 120-125 (July 1960)

Paper, documents, fungi, termites, insects, rodent, beetles, cockroaches, toxics, preservation, review

PDL-40377

American Society for Testing Materials, Philadelphia Pa.
REPORT OF COMMITTEE D-6 ON PAPER AND PAPER PRODUCTS
1961 Preprint 38. 3 p.

Paper, fiberboard, water content, mechanical properties, tests, standards, specification

PDL-40208

U.S. Dept. of Agriculture
WOOD DECAY IN HOUSES, HOW TO PREVENT AND CONTROL IT
House and Garden Bulletin No. 73. Supercedes Farmers' Bulletin No. 1993. (October 1960) 17 p.

Wood, fungi, wood rot, structures, design, biocontrol

1961 Wood 117
Vol.18 PDL-39993

Troxell, H. E. (Colorado State University)
PROGRESS IN WOOD PRESERVATION, 1959-1960
Forest Products J. 11:67-76 (February 1961)

Wood, toxics, application, techniques, tests, service life, weathering, U.S.A., review, bibliography

PDL-39994

Ellwood, Eric L. (California. University. Forest Products Laboratory)
PROGRESS IN WOOD DRYING - 1960.
Forest Products J. 11:55-66 (February 1961)

Wood, seasoning, techniques, review, bibliography

1961 Wood 118
Vol.18 PDL-39917

Loos, Wesley E. (North Carolina. University State College of Agriculture and Engineering)
THE RELATIONSHIP BETWEEN GAMMA RAY ABSORPTION AND WOOD MOISTURE CONTENT AND DENSITY
Forest Products J. 11:145-149 (March 1961)

The relationship between monoenergetic gamma ray attenuation and density was applied to measurement of gross density variations in wood resulting from variations in specific gravity and moisture content. Using a lead-210 (radium-D) source of 47 kev, absorption by yellow poplar sapwood specimens representing a wide range of specific gravities was measured at saturation, fiber saturation, 18%, 9%, and 0% moisture levels.

Analysis of the results shows that when either specific gravity or moisture content is known, the other can be determined nondestructively, rapidly, and accurately by measuring gamma ray attenuation through a given thickness. Wood shrinkage below fiber saturation entails use of separate absorption models above and below fiber saturation. The linear absorption coefficient closely follows the shrinkage rate from fiber saturation to oven dryness.

Wood, water content, physical properties, measurement, technique